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CONTENTS OF VOL. LV.

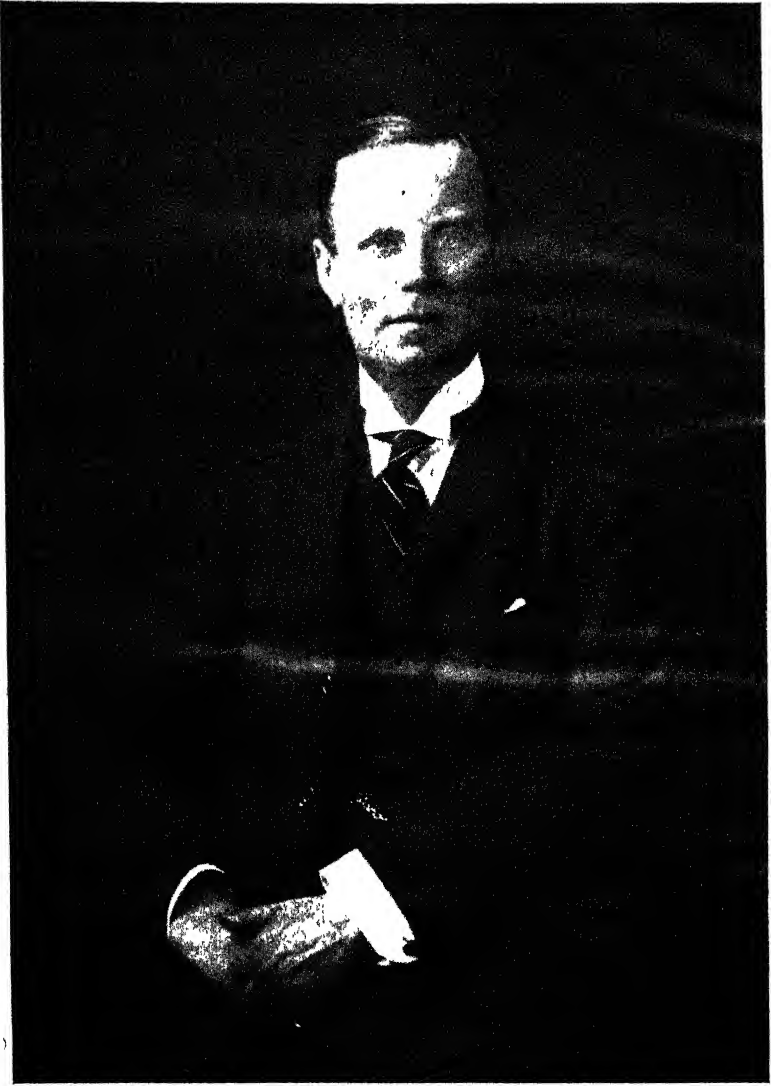
	PAGE
THE GENUS CISTUS. By Sir Oscar Warburg, M.A.	1
WALL PLANTS. By Sir Frederick W. Moore, M.A., V.M.H.	53
REFRIGERATION OF FLOWERS, FRUIT AND VEGETABLES. By F. E. Garnett	64
ORCHID GROWING FOR BEGINNERS. By H. G. Alexander, V.M.H.	72
CONTRIBUTIONS FROM THE WISLEY LABORATORY :	
LV.—ULTRA-VIOLET RAY GLASSES. By M. A. H. Tincker, M.Sc. ...	79
LVI.—PHLOX EELWORM DISEASE. By G. F. Wilson, N.D.H., F.E.S.	88
NEW ZEALAND PLANTS AND THEIR DIFFICULTIES. By Dr. A. H. Williams	101
DELPHINIUMS. By C. F. Langdon	114
THE AWARD OF GARDEN MERIT. By F. J. Chittenden, F.L.S., V.M.H. 121,	276
DAHLIAS TRIED AT WISLEY, 1929	125
BEARDED IRISES TRIED AT WISLEY, 1928-29	132
GAILLARDIAS TRIED AT WISLEY, 1929	141
CANTERBURY BELLS TRIED AT WISLEY, 1928-29	145
BRUSSELS SPROUTS TRIED AT WISLEY, 1928	149
BOOK REVIEWS	153, 281
NOTES AND ABSTRACTS	162, 299
MASTERS MEMORIAL LECTURES :	
✓ STOCK AND SCION RELATIONS. By R. G. Hatton, M.A.	169
ENGLISH GARDEN MAKING UNDER THE EARLY STUARTS. By H. Avray	
Tipping	212
A SHORT SURVEY OF THE GENUS VIOLA. By Lieut.-Colonel E. Enever	
Todd, O.B.E., M.A.	223
WALNUTS. By H. Spence, M.I.Chem.E.	244
FURTHER OBSERVATIONS ON WALNUT GROWING. By A. W. Witt, N.D.H.	257
FLORA OF AFRICAN HIGHLANDS. By T. A. Barnes, F.R.G.S.	266
"SHAB" DISEASE OF LAVENDER. By C. R. Metcalfe	271
TRACHYCARPUS FORTUNEI : A NOTE	280
EXTRACTS FROM PROCEEDINGS :	
GENERAL MEETINGS	i, xxx, lxxviii
ANNUAL MEETING, 1929	i
REPORT OF COUNCIL FOR 1928.....	viii
BALANCE SHEET, 1928	xv
DAFFODIL SHOW, 1929	xxx
DEPUTATION TO TRURO, 1929	xxx
CHELSEA SHOW, 1929	xxxix
PEONY CUP COMPETITION, 1929	xxxiv
SCIENTIFIC COMMITTEE MEETINGS	xxxv, cxvi
FRUIT AND VEGETABLE COMMITTEE MEETINGS	xxxviii, cxix
FLORAL COMMITTEE MEETINGS	xli, cxxix
ORCHID COMMITTEE MEETINGS	lix, clii
NARCISSESS AND TULIP COMMITTEE MEETINGS	lxvii
AMATEURS' FLOWER SHOW, 1929.....	lxxvii
DEPUTATION TO NORWICH, 1929	lxxvii

CONTENTS.

	PAGE
EXTRACTS FROM PROCEEDINGS (<i>continued</i>):	
CLAY CUP COMPETITION, 1929	lxxviii
CULINARY PEA COMPETITION, 1929	lxxviii
DEPUTATION TO DUBLIN, 1929	lxxviii
FOREMARKE CHALLENGE CUP COMPETITION, 1929	lxxix
AUTUMN SHOWS, 1929	lxxix
FRUIT AND VEGETABLE SHOW, 1929	lxxxiii
ORCHID SHOW, 1929	lxxxv
IMPERIAL FRUIT SHOW, 1929	lxxxv
SEWELL MEDAL COMPETITION, 1929	lxxxv
WALNUT COMPETITION, 1929	lxxxvi
ANNUAL MEETING, 1930	lxxxvii
REPORT OF COUNCIL FOR 1929.....	xcix
BALANCE SHEET, 1929	cvi
BOOKS ADDED TO LIBRARY	lxxii
LIST OF DONATIONS TO SOCIETY'S GARDENS, 1929	clxiii
GENERAL INDEX	clxix

NOTICE TO BINDER.

Volume LV has been issued in two parts, each containing the "Journal" proper, paged with Arabic figures, and "Extracts from the Proceedings," paged with Roman figures. This title and contents should be placed first, and be followed by pages i to 168, then by pages 169 to 304. After that should come "Extracts from the Proceedings," pages i to lxxvi, and lxxvii to clxviii, concluding with the Index.



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PRESIDENT, ROYAL HORTICULTURAL SOCIETY.

JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

VOL. LV. PART I. 1930.

A PRELIMINARY STUDY OF THE GENUS CISTUS.

By Sir OSCAR WARBURG, Boidier, Headley, Epsom,
in collaboration with
EDMUND F. WARBURG, Trinity College, Cambridge.

INTRODUCTION.

L'on revient toujours à ses premiers amours.—French proverb.

My affection for the beauties of the Genus *Cistus* dates back to my boyhood, when I first met and admired these lovely creatures in one of their Mediterranean homes. When I began to develop a garden in 1911 I remembered my boy-loves, and undaunted by their reputation for delicacy (and alas! for frailty in their conception of marital relations) I soon arranged a respectable home for them at Headley, 600 feet up, exposed to gales from the North-East in winter and from the South-West at other times. There they have flourished, intermarried, and multiplied, so that now my garden suffers from the same disability as the old woman who lived in a shoe.

The large volume of literature on the genus illustrates the interest which has been attracted to these beautiful plants. My excuse for adding to it is manifold. There is to-day no reliable monograph in English dealing with the genus, SWEET's beautifully illustrated book of 1825-30 being rare, expensive, out of date, and frequently unreliable as to nomenclature. The important work done at the Station of the French Ministry of Agriculture at the Villa Thuret, Antibes, in the production of artificial hybrids, is unknown in this country. The collection of live plants I have been fortunate enough to amass

may perhaps enable me to throw light on some of the problems the solution of which has troubled the systematic writers, some of whom had access only to Herbarium material. And lastly, it may be of value to my fellow-members of the R.H.S.—in other words, all lovers of gardening in England—to have in a concise form such information as I can give them of use to the gardener, the botanist, and the hybridizer.

That there is need of information is demonstrated by a paragraph—full of tragedy—in a recent book of GEORGE BIRMINGHAM, which recounts how :

“The Abbess herself took no part in the blameless activities of her sisters. She professed to dislike goats and did not take the smallest interest in Sister Theodora’s hens. So ignorant was she of rock-gardening that when she came one day on a particularly rare *Cistus* she dug it up with the point of her stick, under the impression that it was a weed. . . .”

I am hoping later on to prepare a comprehensive monograph, adequately illustrated, when, with more complete living material, I shall struggle with some of the more elusive problems discussed in this preliminary study. In the meanwhile I cordially invite the criticism of those able to assist me in arriving at the truth regarding this difficult genus and also the assistance of collectors who may be able to supply some of the deficiencies in my collection.

LITERATURE.

Men are four :

*He who knows not, and knows not that he knows not ; he is a fool—
shun him !*

*He who knows not, and knows that he knows not ; he is simple—
teach him !*

*He who knows, and knows not that he knows ; he is asleep—wake
him !*

*But he who knows, and knows that he knows ; he is wise—follow
him !*

Arabic proverb.

The earliest monograph (of which I was fortunate enough to obtain a copy recently) appears to be that of the Abbé POURRET, written in 1783 and published by Timbal-Lagrave in 1875. DUNAL’s analysis in DE CANDOLLE’S “*Prodromus*” of 1824 was quickly followed by SWEET’S non-analytical collection of pictures and descriptions in 1825–30. SPACH laid down the basis of grouping still adopted (with the reservations indicated later) in 1836 and 1838. The second volume of WILLKOMM’S “*Icones*” is a sumptuously illustrated volume (unfortunately very rare) published in 1856. It provides accurate descriptions, a sound classification, and excellent pictures of all the species and of a good many hybrids. Professor DAVEAU, of Montpellier, published a useful monograph on the *Cistaceae* of

Portugal in 1886. A most important contribution to the study of the genus is included in GROSSER's "Cistaceae," Volume 14 of ENGLER's "Pflanzenreich," published in 1903. This is a very valuable work, which is still easily obtainable, though it suffers from the disadvantages of lack of access to living material. It has been brought up to date (in a condensed form) by JANCHEN of Vienna in ENGLER's "Natürlichen Pflanzenfamilien," Volume XXI.

There remains to be mentioned an important set of pamphlets, of 1910 onwards, by Prof. GARD (now of Bordeaux), dealing with the results of BORNET's and his own highly important experimental work on *Cistus* hybridization at Antibes from 1860 onwards.

I am unaware whether Prof. POIRAULT, now in charge of this work, has published any results. But he has been good enough to furnish me with a list of the numerous hybrids which he has himself re-created at the Villa Thuret and to send me many interesting living plants.

DISTRIBUTION AND CHARACTERISTICS.

*For each one was interpenetrated
With the light and the odour its neighbour shed,
Like young lovers whom youth and love make dear,
Wrapped and filled by their mutual atmosphere.*

SHELLEY, "The Sensitive Plant."

The Genus *Cistus* (Rock Roses) is broadly confined to the countries bordering on the Mediterranean, though the Canary Islands have two endemic species and the Atlantic distribution extends along the coasts of Portugal, Spain and France and up to the Bay of Biscay.*

It consists of about eighteen species, and is closely allied to the Genus *Helianthemum* (Sun Roses), which brightens many a rock garden. It differs from these in having the seed-vessels five- or ten-celled, whilst in *Helianthemum* they are three-celled. *Cistus* is, moreover, a taller race, ranging from about ten feet in *C. laurifolius* to the prostrate *C. crispus*. The flowers, which are white or pink, usually last for a few hours of the morning only, though some species and a good many hybrids retain them rather longer. But during their hours of freshness the bushes present a wonderful picture on a sunny day, covered with fine flowers, often of great beauty, with never a faded petal amongst them, offering a wide range of colour and size of flower which is a delight to behold. Their main flowering time extends for about a month for each species, though in some years occasional flowers appear until the autumn is well advanced. A collection should include some specimens of their beautiful yellow cousins, now classified amongst the *Helianthemums* in the "Kew Hand-list" and as *Halimium* by most of the German writers. Of these, the two forms of *H. formosum* and *H. algarvense* are good examples.

* *C. hirsutus*, naturalized in Brittany, has strayed from a neighbouring garden.

They are easy of cultivation and will grow in almost any soil that is not waterlogged. Their only drawback as garden plants is their incomplete hardiness, with which I shall deal later. As exhibition plants they are difficult, owing to their petal-dropping habit. I speak with some slight bitterness, since a particularly beautiful species which I sent in for exhibition (in the hope of its merits being recognized by an award) to the Chelsea Show two years ago suffered complete ignominy owing to the fact that the exhibition plants had to be judged on this occasion in the evening. My plant had gone to bed by the time the judges saw it (perhaps extra early in anticipation of a long session next day) and had shed every one of its lovely pale pink petals.

Unrebuffed, however, it put forward all its charms next morning, thus showing its cheerful and forgiving spirit. Or was it that it felt that a *Cistus* without A.M. to its name would look as sweet?

One species, *C. ladaniferus*, and one variety of another species, *C. villosus* var. *creticus*, exude a fragrant gum, known as labdanum or ladanum, which has been used in medicine and is still used in perfumery. The essential principle, *Ladaniol*, rejoices in the simple formula $C_{17}H_{30}O$. These forms and their hybrids waft a pleasant refreshing scent into the air on sunny days. The medicinal use in the past appears to have been internally as a stimulant and externally for plasters, while in the East at the present time it is still in use as incense and as a preventive of plague. The leaves and flowers of *C. villosus* were formerly known medicinally under the name of "Herba et flores Cisti maris" and were used as an astringent in cases of dysentery and like diseases. Similarly *C. salvifolius* provided "Herba et flores Cisti foeminae,"* and the roots of this species are still in high esteem for the purpose of healing wounds amongst the native inhabitants of Morocco under the name of "Iferscul." For a time also the leaves were in use in Greece for the preparation of a tea-like infusion.

I have not (though my courage has been proved by a gallant attempt to consume young bracken shoots) yet ventured on such gastronomical experiments with the genus. When, however, I have succeeded in popularizing it sufficiently to enable a "Cistus Sunday" to attract crowds of visitors to my garden on fine days in June, I shall hope to entertain the Council of the R.H.S. with choice samples of Cistus Tea, delicately blended from the choicest kinds.

There is evidence, from SWEET's book, that round about 1840 Cistuses enjoyed much popular esteem in England, though principally as plants for the cold greenhouse. Several forms then in cultivation have disappeared in the interval, but, with a growing interest in these lovely plants arising, it should be possible to reintroduce most of them, and to create many new and beautiful forms by hybridizing and selection.

* Galenus Dodonaeus and Matthiolus and Dioscorides. See Tabernaemontanus.

It must be admitted that most of the species are not fully hardy, and I have deemed it advisable to emulate and develop the insurance policy of NOAH by maintaining a fleet of arks of sufficient capacity to contain in all two specimens of each form at least. My own experience since 1911 at Headley has been very satisfactory on the whole, but it does not cover the severe winter of 1895-6, when, according to BEAN, all the *Cistus* at Kew out of doors were killed by frost except *C. laurifolius* and the hybrids *C. × corbariensis* and the plant which passes as *C. × Loretii*. With me so far the tenderest is *C. vaginatus*, a Canary species, which is nearly always killed, even against a wall. I have endeavoured to indicate relative hardness of the forms in cultivation later. Experience varies in different seasons and at different places. A good deal depends, as might be expected, on the country of origin. Thus I have found *C. monspeliensis* from Canary Island seed distinctly more tender than collected plants from the Riviera. And an Algerian form of *C. laurifolius* (probably the hardest species) var. *atlanticus* (Pitard) seems more tender than the type.

ON CISTUS HYBRIDS IN GENERAL AND RECIPROCAL HYBRIDS IN PARTICULAR.

It is a wise child that knows its own father.—Proverb.

It was in 1860 that ED. BORNET began his experiments in artificial hybridization of species of the Genus *Cistus* at the Villa Thuret, Antibes. He carried them on until 1875 with infinite pains and methodical accuracy and reared some 234 hybrids.* It was not, however, until 1910 that Dr. MED. GARD, now of Bordeaux, to whom BORNET entrusted the important task of study of his notes and of the large mass of material which had resulted (contained in a herbarium of thirty-six large bundles), published his first monograph, which was followed by two further monographs in 1912 and 1914. Dr. GARD also published several shorter articles.

After BORNET'S death the collection of living plants at Antibes perished, but when Prof. POIRAUT was appointed Director of the garden—an experimental station of the French Ministry of Agriculture—in 1899 he set to work to re-create the collection, which by October 1926 consisted of twelve species and varieties and forty artificially produced hybrids.

The genus has produced a good many natural hybrids, one intergeneric and approximately twenty-five interspecific hybrids being recorded. Some of these are of rather obscure parentage, and the Antibes experiments have enabled nearly all the marriage certificates to be accurately prepared. Incidentally it has helped to determine what would otherwise be impossible in the case of most collected plants, the question of which of the two parents was the seed-bearer.

* Auct. GROSSER, *Cistaceae*, p. 6.

The group of French writers who were able to study the rich living material of the region round Narbonne* developed various theories on these questions. They frequently described as having different characteristics the reciprocal crosses formed by the same two parents when the rôles of seed-bearer and pollen-bearer were interchanged.

TIMBAL-LAGRAVE, writing on the *Cistuses* of Narbonne in 1861, advanced the theory† that in hybrid *Cistuses* the leaves formed in the spring resembled those of the pollen-bearing parent, while those formed in the summer, after the flowering period was over, were due to the maternal influence.

GROSSER‡ will have none of this, and roundly accuses the French workers then and later (including BORNET himself) of having been so biased by this theory as to render their work of little scientific value.

I cannot share this view, for GARD's monographs bear evidence of the careful and systematic spirit which anyhow animated him and his coadjutors, even though some of the theories of earlier writers were disproved by his work.

A section of GARD's second monograph§ is devoted to a dispassionate analysis of the characteristics of these reciprocal hybrids. Although in some of the pairs the resultant plants appear to have been indistinguishable, GARD records considerable minor differences in characters in other pairs, which showed a tendency most aptly described by the colloquial expression "to favour your mother." In other cases the set of plants resulting from a cross showed greater variation *inter se* than the fairly uniform set produced by the inverse operation.

I am insufficiently acquainted with the works of WEISMANN, MENDEL, and the large volume of work carried out more recently on Mendelian lines to venture an opinion on this Franco-German conflict. I do not even know whether a well-educated germ-plasm would dream of behaving in the manner that TIMBAL-LAGRAVE suggests. But the subject seems worthy of further exploration. My own contribution at the moment can only take the form of a careful collection of spring and autumn leaves off identical plants for the herbarium, which is part of the immediate Headley programme. I am comforted, as regards subsequent study, by the knowledge that the John Innes Horticultural Institution at Merton, by the kindness of the Director, Sir DANIEL HALL, has been good enough to undertake some experimental hybridization of *Cistus*, so that in the elucidation of problems of this character I shall be able to lean (very hard) on its scientific knowledge and great practical experience.

* In particular the Wood of Fontfroide, where indiscriminate plant-intercourse appears to have been fashionable.

† *Quelques Cistes de Narbonne*, pp. 13 and 14.

‡ *Cistaceae*, pp. 6 and 7.

§ *Recherches sur les hybrides artificiels de Cistes*. Deuxième Mémoire. "Les espèces et les hybrides binaires," chap. v. p. 337 *et seq.*

ON SELF-STERILITY.

*Are God and Nature then at strife,
That Nature lends such evil dreams?
So careful of the type she seems,
So careless of the single life.*

TENNYSON, "In Memoriam."

Amongst the many interesting results recorded in GARD's monographs are those which relate to fertilization. I deal with these results at some length, both on account of their intrinsic interest and because they may be of value to those who are studying similar questions in connexion with fruit trees in general and *Pyrus* in particular.* It appears from the Antibes experiments (which I can confirm in broad principle from my own more limited experience) that many of the *Cistus* species are self-sterile. They do not produce seed when an attempt is made to fertilize flowers with pollen from flowers off the same bush, or with pollen off another bush raised from cuttings of the same stock. The mechanism of successful fertilization, and the indication of stoppage of the ordinary processes at an intermediate stage, in the case of pollen of infertile character, are so well described by GARD that I give the approximate extract (from his first monograph) in full.

According to GARD, *Cistus vaginatus*, *C. laurifolius*, and *C. sericeus* are self-fertile, whereas *C. albidus*, *C. ladaniferus*, *C. hirsutus*, *C. populifolius*, and *C. salvifolius* are self-sterile. The experiments were conducted with every possible precaution. With the reservations given below, my own less carefully guarded experience suggests the same conclusion. My *C. sericeus* has not yet flowered, so that I am unable to express any opinion as to its self-fertility, nor does the detail of crosses given in the monograph afford guidance. The other two species of the same group (*Halimioides* Willk.) are *C. rosmarinifolius* and *C. Bourgeanus*. *C. rosmarinifolius*, of which Antibes appears not to have possessed a specimen, has never produced seed at Headley. My flowering stock was derived from one source only, a nurseryman's; my collected plants have not yet flowered, so that the neglect to produce seed, if not due to climatic conditions, would lead to a preliminary classification of this species as self-sterile. No natural or other hybrids of it are recorded.

C. Bourgeanus, of which a single collected plant flowered with me in 1927, did not produce seed. When a second plant flowered in 1928, seed, which has come true, was produced.

Last year a plant of *C. hirsutus* self-fertilized at Merton produced seed, in contradiction to experiments twice made at Antibes. But the plant of *C. hirsutus* used was of nursery origin, so that the strain may not be pure.

* Cf. DARWIN, *Variation of Animals and Plants under Domestication*, chap. xvii.

Of the absolute self-sterility of *C. albidus* I am not completely convinced. BORNET's two attempts did not produce seed. On the other hand a solitary plant of the white variety which was in my collection in 1922 flowered at a time when I had no other plant of the same species, and produced good seed. The resulting progeny came true to all appearances, and flowered white. Encouraged by this, I distributed seed the following year from the same plant, with every expectation that the progeny would again be white. But the whole of this series flowered pink (friends, please accept this the only intimation !), the plant no doubt having been pollinated in the second year by pollen from some typical pink *albidus* which by that time had been added to the collection. The whiteness would therefore appear to be a recessive character as with most albinos.

F₂ seedlings of an accidental pink hybrid of *C. albidus* (white form) ♀ × *C. villosus* (pink) ♂ produced white and pink flowered plants in approximately the Mendelian proportions of 1 to 3. The white form is pure white, and though some of the pink ones are paler than the typical *C. × canescens* Sweet* (well grown at Kew) there is not a complete range of intermediate hues.

As bearing on the question it should be mentioned that GROSSER † records cleistogamous flowers as occurring in *C. villosus* L. and *C. hirsutus* Lam. I have had no access to the literature to which he refers in this connexion.

A curious hybrid, believed to be *C. hirsutus* × *C. monspeliensis*, for which I am indebted to the Edinburgh Botanic Garden, has no stamens visible to the naked eye.

Flowers of similar character are recorded from various localities ‡ in another hybrid of *C. monspeliensis* (*C. salvifolius* × *monspeliensis*) occurring spontaneously there (and in many other countries), and also in plants which appeared to be pure *C. monspeliensis*.

The artificial hybrid of *C. hirsutus* × *monspeliensis*, however, for which I am indebted to Prof. POIRAUT at Antibes, appears to have normal organs. But Prof. GARD records § that thirteen out of nineteen of a set of hybrids resulting from this cross in 1862 had stamens reduced to staminodes. The plant figured by SWEET as *C. platysepalus*, which is considered by most writers to be this cross, is also normal in appearance. A stamenless plant supplied to me under the name of *C. pilosepalus* (sic) resembled the Edinburgh plant in this respect. GARD || records one set of *C. hirsutus* × *monspeliensis* hybrids which had stamens without anthers.

It therefore appears that the influence of *C. monspeliensis* is responsible for this abnormality.

* I use the name *C. canescens* for convenience. The identification of SWEET's *C. canescens*, figured by him (t. 45) as being the hybrid of *C. albidus* and *C. villosus*, is generally accepted.

† *Cistaceae*, p. 5.

‡ 1. BATTANDIER and TRABUT, *Flore d'Alger*, p. 90.

2. BATTANDIER, *Bull. Soc. Bot. de Fr.*, vol. xxx. p. 163 and vol. liv. p. 545.

3. *Bull. Soc. Bot. de Fr.*, vol. xxx. p. xlv.

§ Third monograph, *Monstruosités et anomalies*, p. 427.

|| *Loc. cit.*

ALBINISM, COLOUR, AND OTHER VARIATIONS.

Can the Ethiopian change his skin, or the leopard his spots?

Jeremiah.

Albinism.—Albino forms of the pink species appear not to be common. A white form of *C. albidus* has been reported from various countries,* and I remember finding as a boy such a plant at Cannes. Many years after, I was successful in collecting a plant in the porphyry hills of the Esterel, to the west of Cannes, which was ultimately established at Headley, after nearly succumbing to the embraces of a pink sister which was intertwined with its roots. (It gained an Award of Merit in 1924.) These two plants and two others in the same area in the Esterel are all I have ever seen in the course of many visits to regions where *C. albidus* grows freely.

A fine white form of *C. villosus* var. *creticus* I owe to the kindness of an Athens correspondent, another of a different *C. villosus* form to Mr. NOTCUTT, and a white form of *C. parviflorus* occurs in Tunis.† These four are the only albinos of which I have so far heard.

The inheritance factors of this variation still remain to be worked out accurately in the light of further observation. I have already recounted my experience with seedlings of *C. albidus albus*. A cross obtained at Headley of *C. albidus albus* with one of the *villosus* varieties is so much paler than the normal cross with the pink form of *albidus* (*C. canescens* Sweet) that I have felt justified in naming it *C. × canescens pallidus*.

My Athens friend has twice sent me seed collected from a plant or plants of *C. villosus* var. *creticus albus*, of which a small proportion have produced plants with pure white flowers.

As regards the colour variations, the most marked appear to be those of *C. albidus* type. In nature there is a considerable range of tint, varying from a deep bluish pink-red to a much pleasanter hue in which blue is much less apparent. But seed collected from the best forms only, produces the same range, possibly owing to cross-fertilization in their original habitat.

A yellow form of the white *C. monspeliensis* is reported by KNOCHE‡ at Cabrera, and POURRET§ speaks of a yellow *C. salvifolius*, distinguishing two forms under the names of *Flore ochrea colore* and *hispanica flore luteo*. He mentions them, or one of them, as occurring notably in the Pyrenees in the Bayonne region and in Spain. This is contradicted by BUBANI|| who, if I understand his choice flights of dog-Latin correctly, is of the opinion that the plants reported as being yellow, even though described by the attractive

* Ivica (Knoche, *Flora Balearica*), Narbonne (Pourret), Riviera (Warburg), Pyrenees (Bubani and Philippe).

† JANCHEN, *Engler's Natürlichen Pflanzenfamilien*, vol. xxi.

‡ *Fl. Balearica* II, p. 194.

§ TIMBAL-LAGRAVE, *Reliquae Pourretiana*, p. 89, authority J. B. Hist. 2 p. 4, Magn. Bot. 67.

|| *Flora Pyrenaea*, vol. iii. p. 126.

name of '*C. aurifolius*,' are dried plants which have become golden in the drying.

This tallies with my own experience, for herbarium specimens acquire a beautiful golden-yellow colour almost immediately, comparable with the hue of *H. formosum*. Thus it seems probable that this exquisite variation is not due to nature but to the Herbalist's art. If any reader can supply me with ladanum gum with which to water the roots of my *salvifolius* plants, perhaps the world may be enriched by a new tall golden *Cistus* to vie with the famous (copper-sulphate-produced) green carnation in attractiveness.

Maculation.—There is only one spotted *Cistus* species recorded, *C. ladaniferus*, though the associated genus *Halimium* * includes many spotted forms. *C. ladaniferus* occurs in a pure white form as well—the *ladaniferus immaculatus* of nurserymen. Although a relatively scarce plant in cultivation in England, it appears to be the predominant form in the South of Spain, where I have found it growing by the acre. At the time of my visit the plants were not in full bloom, so that my omission to find the spotted form there may be accidental; near Fréjus in the South of France, a fortnight later, I found the two forms growing side by side. The Fréjus spotted form was but a poor creature compared with forms in cultivation, the spot being smaller and the flower as a consequence far less beautiful.

Many spotted hybrids exist, showing that the spot is ordinarily transmitted, even though the other parent has none. This is not, however, invariably the case, as a seedling raised at Headley from a finely spotted form of *ladaniferus*, which had accidentally crossed with *C. monspeliensis*, shows no trace of spotting. But the many fine spotted hybrids, *C. × cyprius* (*ladaniferus* × *laurifolius*), *C. × purpureus* (*ladaniferus* × *villosus*), and the *C. × Loretii* (of gardens) and *C. × recognitus* (of gardens, not Rouy and Foucault), testify to the dominance of the spot in inheritance. In the last two hybrids the spot tends to become smaller as the season proceeds. With *C. × recognitus* (of gardens), which has a less pronounced spot than the other, this normally degenerates in the latest flowers into five to seven brown-red lines. A fine immaculate form of *C. × cyprius* is in cultivation; I have no knowledge of its maternal parentage or of the white form of *C. × Loretii* (Rouy and Foucault), which I have not seen. I should, however, anticipate that both these originated from an immaculate seed-bearer.

The lovely rosy-pink spotted *C. × purpureus*, widely in cultivation, needs to be supplemented by an unspotted form which I hope may soon be created.

GARD † states that the spot is definitely dominant, and quotes the results of eleven different combinations. In all of these the spot appeared in all the hybrids except in the cross *C. ladaniferus* × *villosus* (type), where it was absent from the whole set. The cross

* Syn. *Helianthemum* in part.

† *Second monograph*, p. 390.

with other varieties of *C. villosus* gave plants showing a wide variation in size and intensity of the spots.

The function of the spot is obscure. Can it be that it serves the same purpose as the deepened hue sometimes applied to eyelashes surrounding lustrous eyes, namely, to direct attention to the attractions within? I fear this fascinating theory may be attacked on the ground that the individuals not offering these attractions appear to do as well in the marriage market as their painted sisters. Perhaps they possess a different sort of dot!

One other type of variation remains to be mentioned, which has occurred at Headley in a batch of seedlings of *C. ladaniferus* (spotted form). Two of these were multipetalled, the normal five petals being replaced by from 6 to 8 widely overlapping petals. I have heard of this variation occurring elsewhere, and am endeavouring by selection to develop it further. It is still too soon, however, to count on the creation of a new race of *Chrysanthemum Cistus*.

BIGENERIC HYBRIDS.

A little more than kin, and less than kind.

SHAKESPEARE, "Hamlet."

A single bigeneric hybrid is reported as occurring in nature. It was found in South-West France by the Abbés COSTE and SOULIÉ in 1911.* The plant, of which the parents are *Cistus salvifolius* and *Halimium* (syn. *Helianthemum*) *umbellatum*, was named by these distinguished botanists *Cistus* × *Sahucii*, after Monsieur SAHUC, a member of their party. On the nomenclature adopted by JANCHEN the name would be *Halimiocistus* × *Sahucii*.

BORNET succeeded in fertilizing *Halimium halimifolium* with pollen of *C. salvifolius* in 1863 and raised three hybrids. A similar operation in 1865 was unsuccessful, as were other two-sided attempts at crossing different species of the two genera, though several of these produced fruits and infertile seed. I have not seen a full description of this hybrid, named by BORNET *Cistus* × *heterogenus*, and by JANCHEN *Halimiocistus* × *heterogenus*. GARD† indicates that it bears most resemblance to its mother, and has the same characteristic, though in less degree, of having the two external sepals smaller than the three interior ones. It is absolutely sterile, possessing neither ovules nor anthers.

It would be interesting to ascertain whether it resembles the beautiful plant introduced by Messrs. HILLIER under the name of *Cistus* × *wintonensis*,‡ which from its general appearance might well be a bigeneric hybrid with *Cistus salvifolius* and one of the larger spotted *Halimium* species as parents. My own attempts at bigeneric crosses have so far failed.

* *Bulletin de la Soc. Bot. de France*, vol. lviii.

† *Second monograph*, pp. 370 and 371.

‡ Award of Merit, R.H.S., 1926.

HYBRIDS—NATURAL AND ARTIFICIAL.

*The more we are together
The merrier we shall be.*

The Frothblowers' Anthem.

Some two dozen different hybrids are recorded as occurring spontaneously in nature, the bulk of which have also been created artificially at Antibes. A considerable number also have arisen accidentally in gardens.

No hybrids of the pink Canary species (Section I, *Rhodocistus*) or of the three white species of Section VII (*Halimioides*) are recorded. With these exceptions every species has produced natural hybrids. The four pink species of Section II (*Eucistus*) cross freely with one another, as do the six white species of Sections IV, V, and VI. Hybrids between the pink and white sections are rarer in nature, and more difficult of artificial creation, but several of these also exist.

The distribution of natural hybrids is curious. The most widely distributed appears to be that between *C. salvifolius* and *C. monspeliensis* (*C. × florentinus* Lamarck), which is reported from many localities in France, Portugal, Spain, Northern Africa, and Greece. Most of the others occur but rarely, but the departments of the Hérault and Aude in South-Western France have been singularly prolific, about a dozen different hybrid forms, including two triple hybrids and one bigeneric form, having been found in this area by a group of French botanists. Portugal also has produced at least nine natural *Cistus* hybrids and also several crosses of species of *Halimium* with one another.

Perhaps the most curious of all is *Cistus × Skanbergi* (Lojac.), a cross between the pink species *C. parviflorus* and the white *C. monspeliensis* which is recorded as growing on the Island of Lampedusa (between Sicily and Tunis) only. The island appears to be inhabited to a large extent by convicts, but if the appearance of the plant is due to their influence it must be a case of evil turning to good. I am now able to record the discovery of this plant near Athens, where it appears to be not uncommon.* It is a beautiful plant with pale pink flowers.

Another interesting hybrid is described by BATTANDIER † under the name of *Cistus × reghaiensis*.‡ It was found by Prof. TRABUT at Regha near Algiers. It appears to resemble *Cistus × florentinus* (*C. salvifolius × monspeliensis*), which occurs spontaneously there, in all respects except the colour of the flower, which is described as purplish at the edge, grading down to nearly white at the centre. Prof. BATTANDIER could find no other characteristic of any pink

* Mr. SHIRLEY ATCHLEY has kindly sent me cuttings, which are now well established at Headley.

† *Bulletin de la Soc. Bot. de France*, vol. liv (1907), p. 545.

‡ Prof. MAIRE of Algiers University has very kindly given me a herbarium specimen of this unique plant.

species than the flower colour in the plant, and therefore classifies it as a hybrid of *C. salvifolius* × *monspeliensis*. He mentions that *C. heterophyllus* is the only pink species found in the locality, so that it is possible that the plant may be a ternary hybrid.

Two other natural ternary hybrids are recorded by Colonel VERGUIN, both from St. Chinian. One of these, *Cistus* × *Neyraudii*,* he derives from *C. ladaniferus*, *monspeliensis*, and *salvifolius*. The other, *Cistus* × *Hetieri*,† from *C. ladaniferus*, *laurifolius*, and *monspeliensis*. This may be identical with a plant raised at Headley from seed of *C. × cyprius* (*C. laurifolius* × *C. ladaniferus*), a hybrid normally sterile. This seedling shows *monspeliensis* characteristics, and may have been pollinated by that species. The other plants of the series vary between the orthodox parents.

A further natural ternary hybrid, *C. × Ponsii* Foucault and Rouy, is *C. populifolius* × *monspeliensis* × *salvifolius*.

BORNET's experience and my own observations of the relative frequency or infrequency with which different hybrids occur under apparently similarly favourable conditions suggest that the probability of successful fertilization and consequent hybrid occurrence varies very widely with different combinations of species.

The pink species *C. albidus*, *C. crispus*, and *C. villosus* and its varieties, all belonging to one section (*Eucistus*), appear to have a very close affinity. To quote an example: BORNET's fertilization in 1862 of five flowers of *C. albidus* with pollen of *C. villosus* var. *creticus* produced 600 seeds, from which no fewer than 110 hybrids resulted. A similar fertilization of six flowers in 1865 produced 131 hybrids.

Forty-two and forty-nine hybrids respectively were produced by fertilizing six flowers of *C. albidus* with *C. crispus* pollen and *vice versa*. I have seen this hybrid, *C. × pulverulentus*, growing in quantity near Narbonne in a spot where its parents were in contact.

At the other end of the scale I may quote BORNET's fertilization of six flowers of *C. ladaniferus* with pollen of *C. villosus* var. *incanus* which produced six well-developed capsules containing 468 seeds, one hybrid only resulting.

On the limited statistical data provided by BORNET's crosses, usually about four in number for the same combination in different years, often with widely different results, no reliable table of affinity factors could of course be prepared. But it is perhaps permissible to mention that the broad impressions arrived at during my visit to the *Cistus*-hybrid areas of Languedoc, that certain hybrids were more infrequent than might be expected, correspond with low percentages in BORNET's experiments.

Why some districts produce hybrids freely and others very rarely is somewhat of a mystery. There can hardly be great differences in the chances of cross-fertilization by insects, so that perhaps the

* VERGUIN in *Bull. de la Soc. Bot. de France*, vol. lxxi., 1924: "Plantes des Corbières and des Pyrénées."

† VERGUIN in *Bull. de la Soc. Bot. de France*, vol. lxxiii., 1926: "Un nouvel hybride ternaire de Cistes."

solution is to be found in ecological or soil conditions. A region where seedlings have a good chance of growing up owing to lack of competition by other plants might give a better chance of survival of a possibly weakly hybrid than would obtain in the ordinary overcrowded maquis or garigue.* This theory (on which I invite criticism) receives some slight support from information which has been given me regarding the occurrence of the natural hybrid between the bilberry and cowberry (*Vaccinium* \times *intermedium*) at Cannock Chase. A collector observed that it grew most freely where the ground had been disturbed, thus offering a natural seedbed.

It is not disproved by the conditions prevailing in the areas in Languedoc where hybrids occur freely. In many of these stations few other plants than *Cistus* grow, and there are many bare places in the schistose ground where struggling seedlings can establish themselves without competition. Here the different species tend to grow in herds of one or two species over a limited area, a neighbouring space being occupied by different species again (though *monspeliensis* is omnipresent). The hybrids occur with the greatest frequency, though not exclusively, at the boundary areas of the different species. I have noticed a similar tendency at a Spanish station for *C. populifolius* and *C. monspeliensis*.

C. populifolius appears to prefer more congested ground than most of the other species in this area, and where it is in contact with *C. salvifolius* it produces the sturdy hybrid *C. \times corbariensis* very freely. This hybrid is quite fertile and, at one Languedoc station I have visited, it is, with *C. populifolius*, much more prevalent than *C. salvifolius*. The young seedlings appear not to require the absence of competition which most of the other hybrids seem to prefer.

ON INCORRECT NOMENCLATURE.

"Les Jardins Botaniques distribuent par habitude des graines de ces végétaux, mais Dieu seul sait ce que sont ces plantes."

Extract from a letter from a distinguished French botanist regarding *Cistus*.

The complaint of my correspondent quoted above recurs very frequently to my mind when I am endeavouring to identify plants which reach me from nurserymen (some of whom take much trouble to ensure correct naming), private collectors (who might be expected to know), and even botanic gardens (which are of course infallible).

There are certainly in circulation to-day a number of forms which bear names to which they are not entitled. I am at a loss to understand how some of these plants have been christened, and comprehend still less whence some of them have originated. For a long time I have made a practice of ordering any *Cistus* which appears in a

* The terms "maquis" and "garigue" refer to the thickets of scrub vegetation which arise where maritime pine and Aleppo pine have been felled, respectively.

nurseryman's catalogue under an unfamiliar name, a process which has enriched my collection by many interesting plants, as well as a good deal of rubbish.

Thus two purchases of *Cistus hybridus* (so-called) from different sources have yielded two apparently different but unplaceable white hybrids. Two *Cistus lanuginosus* (so-called) were *Cistus* × *laxus* (*C. hirsutus* × *populifolius*) and a triple mongrel respectively. The true *C. populifolius* can now be obtained from several nurserymen, but one good firm supplied me with *C. laurifolius* under that name. *C. candidissimus* is not, I believe, in cultivation in this country, the plant ordinarily supplied being its close sister *C. vaginatus*. And the naming of the different varieties of *C. villosus*,* a very difficult series, should be verified by enquiry as to origin, if importance is attached to correctness and purity of strain.

But these are minor evils. The real trouble is that there are several very useful plants in general circulation, including some of the forms most worth growing, which have been carefully named with names belonging to other (and sometimes less desirable) forms.

Thus the *C. crispus* of most nurserymen is not *C. crispus* at all, but a hybrid of *C. crispus* and *C. albidus*, to which its seedlings revert in greater or less degree. It should be named *C. × pulverulentus* Pourret (syn. *C. × Delilei* Burnat). It is also distributed under the names of *Cistus* 'Warley Rose,' 'Sunset,' and other titles. It is a better garden plant than *C. crispus* (true) in stature, though not quite so pure in colour.

Again, the plant in wide circulation as *C. × Delilei* (*C. crispus* × *albidus*) is really a not very good form of *C. villosus*.

And that most excellent garden plant, *C. × florentinus* of nurserymen, one of the most valuable low-growing Cistuses, should be, if correctly named, a hybrid of *C. salvifolius* × *C. monspeliensis*. But the large-leaved *C. florentinus* of gardens does not tally with any of the natural hybrids in the Kew Herbarium, which all have small leaves, nor with forms I have collected in France and one I have received from Athens, or with an artificial cross I have obtained from Antibes. Some Headley seedlings of *C. florentinus* of gardens developed into so many forms of varying foliage and stature as to suggest that it may be a ternary or quaternary hybrid, though this theory requires verification by protecting the plants from which seed is taken from the possibility of outside pollination, a precaution which had not been taken with the series to which I refer.

And next it is my painful duty to attack the naming of an old and valued friend, *C. × Loretii* of gardens, one of the best and hardiest of the group. It is a fine, rather low-growing plant with large white flowers with a good brown spot, and curiously shiny leaves. LORET's plant, named *C. × Loretii* by Rouy and Foucault, is a hybrid between *C. ladaniferus* and *C. monspeliensis*. I had no suspicions of the *C. × Loretii* of gardens until I raised an unmistakable hybrid of these two species at Headley amongst a batch of *ladaniferus* seedlings, and

* *C. creticus*, *tauricus*, *incanus*, *corsicus*, etc.

received another, artificially created at Antibes. These were so different from the *Loretii* of gardens as to cause me to study that plant with care. It is certainly not LORET's * plant, which I have since collected in his original locality, and though *C. ladaniferus*—the only spotted *Cistus*—must be one parent, *C. hirsutus* and not *C. monspeliensis* is most probably the other. The "Botanical Magazine" figure 8490 illustrates *C. × Loretii* of gardens and not that of Rouy and Foucault.

Another difficult problem is afforded by a plant in general circulation as *C. × recognitus*, a name which properly belongs to the hybrid *C. laurifolius × C. monspeliensis*. There are two plants distributed under this name: the one to which I now refer is an excellent garden plant with white flowers bearing a slightly less marked spot than *C. × Loretii* of gardens. It is of taller habit and the leaves have not the shiny characteristic of the latter. Obviously, again, *C. ladaniferus* must be one parent.

I am endeavouring to identify this interesting pair with the kind assistance of Dr. OTTO STAPF.

Both plants are figured with comments in MAUND'S "Botanic Gardens," 1825-51, under the names of *C. lusitanicus* (for *C. recognitus* of gardens) and *C. lusitanicus* var. *decumbens* (for *C. Loretii* of gardens), but there may be an earlier description.

The other plant supplied to me under the name of *C. recognitus* † is entirely different, though also not true to name. It is a first-rate garden plant with unspotted white flowers, forming large compact bushes up to four feet in height. The characteristic features are the harsh feeling of the leaves (usually a characteristic of *C. populifolius* hybrids) and their wavy margins, which produce a very pleasing effect. The plant is not dissimilar from an artificial hybrid of *C. populifolius* and *C. hirsutus* which I have received from Antibes, but the hairs on the stems are shorter. This might, however, be due to the use of different varieties of *C. populifolius* in the two crosses.

CISTUS VARIUS Pourret (CISTUS POUZOLZII Delile).

*Ah, what a dusty answer gets the soul
When hot for certainties in this our life !*

GEORGE MEREDITH.

I have mentioned earlier a source of Franco-German difference of view as to the rules of the noble sport of parent-guessing in hybrids. If that is the Alsace of Botany, the case of *Cistus varius* Pourret (*Cistus Pouzolzii* Delile) ‡ is the Lorraine. This rare and mysterious plant is found in Languedoc and Algeria and is also reported from Spain. Most French writers consider it to be a species, while the Teutonic authorities roundly denounce it as being certainly a hybrid,

* Described by him in *Bull. de la Soc. Bot. de France*, 1866, p. 454. See also ROUY and FOUCAULT, *Flore de France*, 1895, vol. ii, p. 279.

† By Messrs. SMITH of Newry.

‡ *Cat. hort. bot. Monsp.*, 1839.



FIG. 2.—WHITE-FLOWERED CISTUSES IN THE GARDEN.



FIG. 3.—*CISTUS ALBIDUS*, PINK AND WHITE FORMS, AND (AT BACK) *C. MONSPELIENSIS*.

[To face p. 17.

the putative parents being *C. monspeliensis* and *C. crispus* or *C. albidus* according to taste.

The character of the plant, from the descriptions and figures I have seen, certainly suggests such a parentage as possible and even probable, but I shall detail the difficulties to be overcome before this view can be accepted. It is a plant about two feet high, with white flowers similar to those of *C. monspeliensis*, but with undulate leaves crisped at the margin and deeply veined with rugose venation.

In the time of CLUSIUS (or shall we follow the example of the R.H.S. Library and call him CHARLES DE L'ESCLUSE?), towards the end of the sixteenth century, it appears to have been called, after the fashion of that time, *Cistus Ledon IV*. It is described and figured under this name by MATTHIAS DE LOBEL of Antwerp in 1576 and JACOBUS THEODORUS TABERNAEMONTANUS of Frankfurt a./Main in 1590. (Forgive these references, gentle reader; a name like that could not be wasted!)

The Abbé POURRET christened it *Cistus varius** in 1783, while DELILE named it *Cistus Pouzolzii*† in 1839.

From the beginning of critical botanical study it seems to have presented difficulties.

POURRET in his description‡ refers to the leaves as being sometimes like those of *C. crispus*, sometimes like those of *C. salvifolius*. TIMBAL-LAGRAVE, who edited POURRET's Monograph, recants in footnotes a view he expressed in another work§ that the plant was a hybrid of *C. albidus* and *C. monspeliensis*. In this earlier work he refers to the difference in the summer leaf-growth from that of the spring, as supporting his theory mentioned in an earlier chapter. He describes the summer leaves as being rugose, undulate, oval-lanceolate, and those of the spring as being neither rugose nor undulate.

DUNAL was also puzzled by the plant and sent a specimen to Kew in June 1838 with a letter which is now in the Kew Herbarium, discussing the problem.

Later on BORNET at Antibes devoted special attention to it and was convinced that the plant is a true species. He failed to produce it artificially, though he attempted to fertilize 28 flowers of *C. crispus* in all in three different years and 15 flowers of *C. albidus* in two different years with pollen of *C. monspeliensis*, as well as attempting the inverse crosses. GROSSER and JANCHEN dismiss this evidence by the statement that "he failed to produce this hybrid artificially, as was the case with other natural hybrids," which seems more comfortable than convincing.

GARD, who described BORNET's results, adduces many reasons, based on anatomical characters,|| why the plant should be considered a species, and places it in his classification between two pink species,

* *Reliquae Pourretiana*, pp. 100 and 120.

† *Suppl. cat. hort. bot. Monsp.*

‡ *Loc. cit.* p. 100.

§ TIMBAL-LAGRAVE, *Quelques Cistes de Narbonne*, p. 55.

|| "Rôle de l'anatomie comparée dans la distinction des espèces de Cistes," *Compte Rendus Ac. Sc.* 1907.

C. crispus and *C. villosus*. WILLKOMM * has placed it with *C. monspeliensis* in the Section *Stephanocarpus* ROUY and FOUCAULT† created a special section (*Stephanocarpoidea*) for its benefit.

Prof. POIRAULT, now in charge at Antibes, considers it a true species.

Dr. R. MAIRE, Professor of Botany at the University of Algiers, informs me that he is quite satisfied that it is a true species, and that it occurs in Algeria in the Atlas of Blida in places where *C. crispus* does not exist, where it behaves like a perfectly legitimate species. I have collected it in this locality, where it was abundant and stable, being associated with *C. salvifolius*, which also grew in quantity, but I could see no pink species whatever, though the conditions were not ideal for accurate observation. A sloshy zigzag narrow mountain road, half covered with melting snow, with rain falling steadily and a mountain mist rising, induces a nervous chauffeur, anxious to return alive, to hurry up those engaged in the pursuit of pure science.

I do not know whether the French form of *C. varius* is identical with the Algerian in all respects. I have visited one of the French stations (in a mountain valley where only *C. populifolius* and *C. salvifolius* were met), but failed to locate the plant in the rain in the limited area where it is recorded at this station.

The seed is much larger than that of any other *Cistus*, and the seed-vessels are healthy and quite unlike the stunted efforts of some of the hybrids I have met between even closely related species, so that I have no hesitation in accepting the French view of the specific character of the plant.

SUNDRY QUESTIONS.

"The time has come," the Walrus said,
 "To talk of many things:
 Of shoes, and ships, and sealing-wax,
 Of cabbages, and kings,
 And why the sea is boiling hot,
 And whether pigs have wings."

LEWIS CARROLL.

There remain a few general questions which have so far not been referred to, some of which have received but limited study by botanists.

Sensitiveness of Stamens.—Some species have sensitive stamens which move rapidly outwards when the filaments are bent, until they lie against the petals, resuming their original position after a short rest-period. The purpose of this movement, if any, is no doubt to facilitate outside fertilization by insects, but the exact application of the principle is far from clear.‡

* *Cistinearum orbis veteris descriptio monographica*, 1856.

† *Flore de France*, 1895, vol. ii. p. 261.

‡ See KNOLL (1914 b), "Zur Ökologie und Reizphysiologie des Androeceum von *Cistus salvifolius* L.," *Jahr. Wiss. Bot.* 54, 498; and MCGREGOR SKENE, 1924, *The Biology of Flowering Plants*, pp. 389-391.

Distribution.—The reasons for the narrowness of distribution of some species and the wide occurrence of others seem worthy of consideration. The Canary Island species of the Section *Rhodocistus* do not occur on the mainland, and one of them appears to be very limited in its occurrence on the island of Teneriffe. Two species, *C. heterophyllus* and *C. sericeus*, are found only in Algeria. Climatic conditions no doubt account for this and for the occurrence of several local forms of other species in Northern Africa. *C. Bourgeanus* is confined to Southern Portugal and South-West Spain, while *C. salvifolius* ranges from Spain in the West to Asia Minor, and *C. monegasensis* from the Canaries and the Atlantic seaboard to Greece and the Archipelago. These are perhaps normal episodes of distribution. A curious incidence is that of *C. laurifolius*, which occurs in Morocco (var. *atlanticus* Pitard), the Peninsula and Mediterranean South-Western France, and also along a strip of the western coast of Asia Minor, from Bithynia to Cilicia, but not in the wide intervening region, a gap of nearly a thousand miles.

The very local occurrence of *C. varius* (q.v.) suggests that it may be an unsuccessful species which survives only in a few localities particularly lenient to its idiosyncrasies.

Chromosomes.—Dr. COLLINS, of the John Innes Horticultural Institution at Merton, who was good enough to study the chromosomes of the root-tips of twelve species and one hybrid, informs me that in all the species examined the number was 18, an unexpected result. He did not make a close examination of form and size, but the general impression gained was that the chromosomes were pretty uniform throughout also.

False Hybrids.—GARD refers * to the occasional occurrence of a small proportion of plants in a set of hybrids which appear to be identical with the seed parent, and in one case with the pollen-bearer. In this latter case he records certain minor differences. He is satisfied that the precautions taken prevented any possibility of stray pollen infection, and that these plants were "false hybrids" similar to those discussed by MILLARDET in the Genus *Fragaria*.†

The Flail or Scourge of Osiris.—An interesting paper, published by Mr. PERCY NEWBERRY this year in the "Journal of Egyptian Archaeology," ‡ gives a large amount of valuable information as to the methods of collection of ladanum gum in the East. The writer suggests that the so-called Flail was in effect the instrument used for the collection of this gum, by gentle contact with the ladanum-bearing *Cistus* plants. This is an alternative method to that of collection from the beards of goats which have been browsing on the plants.

* *First monograph*, p. 106; *Second monograph*, p. 381.

† *Extraits des Mémoires de la Soc. des Sciences Physiques et Naturelles de Bordeaux*, t. iv. 4ème série, 1894.

‡ Vol. xv. parts 1 and 2, 1929.

A NEW SPECIES OF CISTUS?

During the summer of 1929 Messrs. SHIRLEY ATCHLEY and INGWERSEN found a *Cistus* growing in quantity on the slopes of Mount Pindus in Northern Greece at an altitude of about 1500 to 2000 feet. The plant has white flowers about $1\frac{1}{2}$ inch in diameter, and bears fertile seed of which Mr. ATCHLEY has sent some packets to this country which is now germinating freely. Mr. ATCHLEY, who is thoroughly familiar with the Greek *Cistuses*, is convinced that the plant is not a hybrid and that it is a new species. Should, as I anticipate, his view prove correct, I hope that whatever botanist describes the plant first will adopt Mr. INGWERSEN's suggestion of naming it in honour of his indefatigable keen-eyed and unselfish co-discoverer.

CULTURAL NOTES.*

Seeds.—If sound and ripe, are better if kept till early spring and sown in warmth. They germinate in about 7 to 10 days, and grown straight on, the smaller varieties flower in the second year. Some species, e.g. *C. ladaniferus*, *C. populifolius*, *C. vaginatus*, *C. monspeliensis*, flower the third season. *C. laurifolius* sometimes takes four years.

If the seed is suspicious, unripe or unsound owing to weather, it is as well to sow immediately when gathered, as such seed will not keep. The seedlings need careful handling as regards watering and airing, and I have never noticed any *Cistus* flower a season earlier through autumn sowing nor any great difference in the size of the plants.

Seedlings should be pricked out as soon as possible into small pots, owing to their very long thread-like root soon becoming matted. When hardened about June they can be placed in their permanent quarters.

Soil needed for Pots.—Equal parts of loam and leaf soil with a little sand if loam is heavy. Lime in any form in pot soil seems to be detrimental, even though some of the varieties do not object to it when planted out.

Cuttings root best, taking half-ripened wood, with a heel if possible, about August or September according to season, in sandy soil and in a cool shady frame under a north wall, but take steps to keep the frame dry, as cuttings easily damp off. Some species remain till the following March (e.g. *cypricus*, *ladaniferus*) before rooting. Cuttings, of course, flower the following season.

Soil Outdoors.—Too much stress cannot be laid on the fact that manure is detrimental to *Cistus*. If rich ground is used they make soft growth which will get cut with frost and they do not flower so well as plants in poor ground. A little shade seems to do no harm, except in reducing the number of flowers. The ideal conditions are

* By Mr. B. LEACH, head gardener to Sir OSCAR WARBURG.



FIG. 4.—CISTUS OCHREATUS.
(From Sweet's "Cistinae," t. 3.)

[To face p. 20.]

those given by a bank facing south, well drained, stony and poor. Any natural humus will establish them quicker, but it is immaterial whether the soil is clay or loam.

CLASSIFICATION.

Sections according to GROSSER, except as to *C. varius* Pourret which is placed in a separate section, following ROUY and FOUCAULT.

GENUS. CISTUS *Linnaeus*.

Section I.—*Rhodocistus* Spach. Flowers pink. Sepals 5 outer much smaller than the inner. Style filiform, curved. (See p. 22.)

1. *C. symphytifolius* Lam. (syn. *C. vaginatus* Aiton).
2. *C. ochreateus* Chr. Smith (syn. *C. candidissimus* Dunal).
3. *C. osbeckiaefolius* Webb.

Section II.—*Eucistus* Spach. Flowers normally pink. Five sepals equal in size. Style filiform, straight. (See p. 23.)

4. *C. albidus* L.
5. *C. crispus* L.
6. *C. heterophyllus* Desf.
7. *C. villosus* L.

Section III.—*Ledonella* Spach. Flowers normally pink. Five equal sepals. Style very short, not filiform. (See p. 28.)

8. *C. parviflorus* Lam.

Section IV.—*Stephanocarpoidea* Rouy and Fouc. Flowers white. Sepals 5, the two outer enclosing the inner. Style long. (See p. 29.)

9. *C. varius* Pourret (syn. *C. Pouzolzii* Delile).

Section V.—*Stephanocarpus* Spach. Flowers white. Sepals 5, the two outer enclosing the inner. Style very short. Placentae with 4 ovules. Sepals not cordate at base. (See 29.)

10. *C. monspeliensis* L.

Section VI.—*Ledonia* Dunal emend. Willkomm. Flowers white. Sepals 5, the two outer enclosing the inner. Style very short. Placentae with 8–10 ovules. Sepals cordate at the base. (See p. 30.)

11. *C. hirsutus* Lam.
12. *C. salvifolius* L.
13. *C. populifolius* L.

Section VII.—*Ladanium* Spach. Flowers white, large. Sepals 3. Tall shrubs. (See p. 33.)

14. *C. ladaniferus* L.
15. *C. laurifolius* L.

Section VIII.—*Halimioides* Willkomm. Flowers white, small. Sepals 3. Dwarf shrubs. (See p. 35.)

16. *C. sericeus* Munby.
17. *C. rosmarinifolius* Pourret.
18. *C. Bourgaeanus* Cosson.

NOTES ON THE DIFFERENT SPECIES AND HYBRIDS.

The object of the following notes is to indicate to cultivators the salient features of each form described, with an estimate of its garden value and hardiness, based on Headley experience. My garden is at a height of 600 feet, on clay and in an exposed situation. References are given to enable the full description to be consulted if required. I have relied on BEAN'S "Trees and Shrubs" for information as to the date of introduction of the forms described by him, and have in some cases made use of his valuable descriptions. I have used the term "in cultivation" to mean in cultivation in Britain. All the species are evergreen, and the flowers of all the white species have a yellow stain at the base of the petals which is normally inconspicuous, being hidden almost completely by the stamens. I have therefore not made mention of it in the descriptions.

The species which can safely be raised from seed are *C. vaginatus*, *C. parviflorus*, *C. monspeliensis*, *C. laurifolius*, and *C. Bourgaeanus*. *C. ladaniferus* normally comes true, with a small percentage of hybrids with other white species. Seed of the species in the sections *Eucistus* and *Ledonia* cannot be relied upon if other species in their sections, or hybrids of those species, are cultivated near them. All can be raised from cuttings except *C. laurifolius*, which is very difficult.

I have not yet been able to investigate in detail the differences, claimed to exist by many of the French writers whose opinion is entitled to great respect, between reciprocal hybrids of the same pairs of species. In the following notes, therefore, no distinction has been made between these reciprocal hybrids, except where stated.

Rhodocistus Spach :

The members of this section are all endemic to the Canary Islands and are differently classified by different authors. The only species which appears to be common is *C. symphytifolius* Lam. (syn. *C. vaginatus* Aiton), and this is recognized as a species by all writers on the group. Besides *C. symphytifolius* GROSSER and WILLKOMM recognize as a species *C. ochreatus* Chr. Smith (syn. *C. candidissimus* Dunal and *C. symphytifolius* var. *leucophyllus* Spach), GROSSER giving as an additional synonym *C. osbeckiaefolius* Webb.* GARD, on the other hand, treats *C. osbeckiaefolius* as a species, stating that it differs from *C. symphytifolius* in numerous structural characters, and regards *C. ochreatus* as a variety of *C. symphytifolius*. The only plants or specimens I have seen, other than *C. symphytifolius*, are those in the Kew Herbarium. Here there are certainly two distinct forms represented besides *C. symphytifolius*, one agreeing with the *C. candidissimus* of DUNAL, the other being a plant collected by BOURGEOU and labelled *C. osbeckiaefolius* by him or by WEBB. Both these seem on a preliminary examination worthy of specific rank and I therefore, provisionally, treat the group as consisting of three species.

* Mscr. in Bourg. Pl. canar.

1. *C. symphytifolius* Lam. (syn. *C. vaginatus* Aiton and *Rhodocistus Berthelotianus* Spach).

In cultivation under the names of *C. vaginatus* and *Rhodocistus Berthelotianus*. It is also sometimes erroneously supplied as *C. candidissimus*.* It was introduced in 1799. Canary Islands.

It is a strong-growing plant, 5 to 6 feet high in the Canaries, with distinctive large ovate-lanceolate leaves, up to 4 inches long, and covered with long hairs. It is a rapid grower, but too tender to be of much use out of doors, surviving only the mildest winters even when given wall protection. The flower is of a good pink colour, but it is ragged and untidy, a distinctive feature being the gaunt appearance of the curved projecting style.

A variety *hirsutissimus*, is also recorded.

For detailed description and figures see SWEET, t. 9 (not a good picture); WILLKOMM, "Icones," 13, t. 75; GROSSER, p. 11.

No hybrids are recorded.

2. *C. ochreateus* Chr. Smith (syn. *C. candidissimus* Sweet). (Fig. 4.)

In cultivation in SWEET's time at Chelsea Physic Garden, but not now in cultivation. All the plants I have seen in gardens under the name of *C. candidissimus* are the previous species.

I have so far been unable to obtain a plant or seed.

Grand Canary, very local.

SWEET's and WILLKOMM's figures and the Herbarium specimens I have seen suggest that it is a fine and distinct plant with white felted leaves of a similar appearance to those of *C. albidus* and a large pale pink flower of neater appearance than that of *C. symphytifolius*.

For description and figures see SWEET, t. 3; WILLKOMM, "Icones," 14, t. 76; GROSSER, p. 12.

3. *C. osbeckiaefolius* Webb.

This plant has never to my knowledge been cultivated in this country.

Teneriffe, Palma.

The specimens in the Kew Herbarium differ from the other species of this section by their much smaller leaves, up to 1½ inch in length, and by the white silky hairs which occur on the stalks and petioles and to a lesser degree on the leaves. I have seen no full description.

Eucistus :

4. *C. albidus* L.

In cultivation since 1640, though not now so common as its merits deserve.

S.W. Europe and N.W. Africa, often on calcareous soils.

A very handsome plant not exceeding 4 feet, which derives its name from its white felted leaves up to 2½ inches long, by which it

* See *C. ochreateus*.

can easily be distinguished from any other plants in cultivation, except its hybrids. The handsome pink flowers, about $2\frac{1}{2}$ inches across, vary considerably in colour. They are frequently of a magenta tone, which is not offensive in brilliant sunshine.

I find it difficult to express an opinion for the guidance of others as to the hardiness of this species, which Mr. BEAN classifies as one of the hardier species at Kew. At Headley it often suffers badly, even in normal winters, though a plant in the open survived the heavy frosts of the early part of 1929.

For detailed descriptions and figures see SWEET, t. 31; WILLKOMM, "Icones," 17, t. 77; GROSSER, p. 13; BEAN, "Trees and Shrubs," 1921, vol. i. p. 343.

The following hybrids are known :

In nature :

with *C. crispus* = *C. × pulverulentus* Pourr.* (syn. *C. × Delilei* Burnat)

with *C. heterophyllus*—Algeria (Battandier and Trabut)

with *C. villosus* = *C. canescens* Sweet †

with *C. monspeliensis* = *C. ambiguus* Rouy and Fouc.—Languedoc (possibly also Algeria)

with *C. hirsutus*—Portugal (Daveau)

with *C. salvifolius* = *C. Albereensis* Rouy and Fouc.—S. France (? Portugal), and *C. Gautieri* Rouy and Fouc.—S. France (? Portugal).

In gardens :

with *C. villosus* = *C. canescens* Sweet.†

Other hybrids have been created artificially at Antibes and are cultivated there.

Var. *albus* Warburg, nom. nov. (Fig. 5).

A pure white form ‡ is recorded from various areas where the type occurs. It is in cultivation from a plant collected by me in the South of France. It only differs from the type in the colour of the flowers. It is a very handsome and useful companion to the type for garden purposes.

The following hybrid has arisen at Headley :

with *C. villosus* = *C. canescens* var. *albus* Warburg.§

5. *C. crispus* L.

Said to have been introduced in 1656 and in cultivation in SWEET'S time. The only plants in cultivation in England at the present time of which I have knowledge have resulted from plants collected by me in Spain in 1925, the plant ordinarily masquerading under this name being the hybrid *C. × pulverulentus*.*

S.W. Europe and North Africa.

* See p. 36.

‡ Award of Merit, R.H.S., 1924.

† See p. 38.

§ See p. 38.

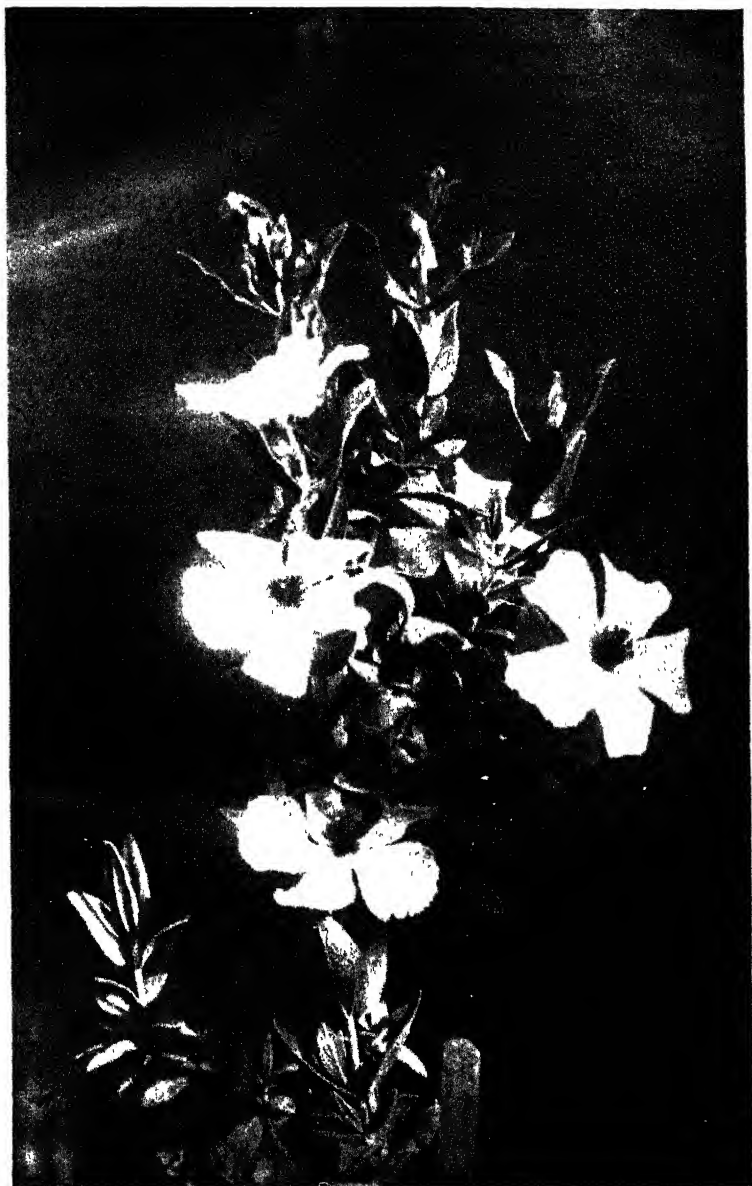


FIG. 5.—CISTUS ALBIDUS ALBUS.

[To face p. 24.



FIG. 6.—CISTUS X PURPUREUS.

[To face p. 25.

A beautiful plant with deep pink crimson flowers, of a much purer tone than either *albidus* or *villosus* and even than the hybrid above referred to. The leaves are small (up to $1\frac{1}{2}$ inch long in cultivation), greyish-green, deeply furrowed, wrinkled, with markedly crisped edges. Plants from Algeciras in the South of Spain are completely prostrate in habit, forming large mats. The French forms are rather more erect, though under a foot in height.

It survives moderately cold winters, and is a valuable garden plant owing to its colour and habit.

For detailed description and figures see SWEET, t. 22 (unreliable plate); WILLKOMM, "Icones," 18, t. 78; GROSSER, p. 13.

The following hybrids are known:

In nature:

with *C. albidus* = *C. × pulverulentus* Pourr.* (syn. *C. × Delilei* Burnat)

with *C. salvifolius* = *C. × novus* Rouy and Fouc.—France (Dept. of Aude).

Artificially:

Several hybrids have been created at Antibes, of which *C. crispus* ♀ × *C. villosus* var. *creticus* ♂ = *C. × crispatus* Bornet is in cultivation at Headley.†

Var. *vestitus* Hooker.

A silky form from Morocco in the Kew Herbarium.

6. *C. heterophyllus* Desf.

Introduced in 1817 and in cultivation in SWEET's time. I know of no plants in this country other than those at Headley, collected in Algeria in 1929. I have seen plants labelled as this species which are untrue to name.

Algeria.

A much-branched shrub, about 2 feet high in Algeria, which, with another Algerian species, *C. sericeus*, is much more twiggy than any of the other species. The dark green, slightly viscous leaves vary greatly in size, shape and character. The juvenile leaves have the margins revolute, the lower leaves being ovate-orbicular, the upper ones lanceolate. From this variability it derives its name. The few early flowers which I met with in February in Algeria were of a fine deep crimson.

If this plant proves to be even moderately hardy, it should be a valuable addition to our gardens and a useful parent for hybrids.

For detailed description see SWEET, t. 6; WILLKOMM, 26, t. 84; GROSSER, p. 14.

The following hybrids are known:

with *C. albidus*—Algeria (Battandier and Trabut).

with *C. villosus*—Algeria (Battandier and Trabut).

* See p. 36.

† See p. 38.

7. *C. villosus* L. (syn. *C. polymorphus* Willkomm emend.) (Fig. 7.)

A very difficult polymorphic species or group of species, variously and inconsistently classified by different systematic botanists. LINNÆUS gave three forms specific rank under the names of *C. villosus*, *C. incanus*, and *C. creticus*. WILLKOMM treated *C. creticus* as a species, and grouped the other forms under the specific name of *C. polymorphus*, which he then divided into two sub-species, each containing several varieties and forms. BORNET extended the term *C. polymorphus* to include LINNÆUS' *C. creticus* and divided this *C. polymorphus* into four sub-species, LINNÆUS' three, i.e. *C. villosus*, *C. incanus*, and *C. creticus*, with the addition of *C. corsicus*, first distinguished by LOISELEUR in "Mém. Soc. Linn.," Paris, vi. (1827), 416. GROSSER gave a fresh classification, with which JANCHEN does not entirely agree.

My own collection of forms is not yet nearly complete, but it justifies the preliminary conclusion that *C. creticus*, the variety producing ladanum gum, is a very distinct form, perhaps worthy of specific rank.

In addition to those mentioned above, forms have been described under the names of *C. tauricus* and *C. mauritanicus*. Most of these names have a definite and consistent significance, but confusion exists in the use of the denominations *C. incanus*, *C. villosus*, and *C. tauricus* by different writers. Some writers describe forms under the names of var. *undulatus* and var. *rotundifolius*, which they classify as garden forms. I have as yet no evidence that these forms justify the prominence which has been given to them.

I hope to be able to contribute towards the elucidation of these difficulties at a later date, and would in the meantime be grateful for seed collected on the spot in any of the areas where the plant is found, or cuttings of plants of equally untainted origin. Seed from garden plants is liable to taint from other pink-flowering *Cistus*.

In different forms it occurs throughout the whole Mediterranean area except Spain, Portugal, France, Tunis, and Egypt. It is found in most of the Mediterranean islands and rarely in the Canaries.

In all its forms it is readily distinguishable from *C. albidus* and *C. crispus* by its leaves, which are not 3-nerved. They are rugose, green or hoary, but never felted like *C. albidus*, and not sessile but stalked, though sometimes shortly; in some forms the petioles are connate at the base. The forms I have seen do not vary greatly in stature, which is 3. to 4 feet, and the pink flowers, 2 to 2½ inches across, are not very pure in tone.

The forms I have at Headley are often killed out of doors in moderately severe winters, a similar experience to that at Kew, and the garden value of the plant is inferior to that of the other species of the section *Eucistus*.

For descriptions and figures see SWEET, t. 35, 63, 75, 112 (various forms, unreliably named); WILLKOMM, "Icones," 20, t. 79 to 82;



FIG. 7—*CISTUS VILLOSUS*.

GROSSER, p. 14; ROUY and FOUCAULT, "Flore de France," vol. ii. p. 259.

Var. *albus*.

I have a white sport of one of the forms other than *creticus*, received from Mr. NOTCUTT, which originated in a garden at Cambridge.

Var. *creticus* (L.) Boiss.

Distinct for its stickiness and scent of ladanum. Leaves small, thickish, very wrinkled, very wavy at the edge.

Eastern Mediterranean.

Var. *creticus albus* Warburg (var. nov.).

A pure white form received from Mr. ATCHLEY from Athens.

The following hybrids are known :

In nature :

with *C. albidus* = *C. canescens* Sweet *

with *C. heterophyllus*—Algeria (Battandier and Trabut)

with *C. monspeliensis* ?—Albania and Thessaly (Grosser).

In gardens :

with *C. parviflorus* = *C. × cymosus* Dunal †

with *C. ladaniferus* = *C. × purpureus* ‡ Lam.

with *C. laurifolius* = *C. 'Silver Pink.'* §

Artificially at Antibes :

Numerous hybrids between the various varieties discussed above and also between them and *C. albidus* and *C. crispus* were created by BORNET and some by POIRAULT. Of these *C. crispus* ♀ × *C. villosus* var. *creticus* ♂ = *C. × crispatus* || Bornet is in cultivation at Headley.

Ledonella :

8. *C. parviflorus* Lam. (syn. *C. complicatus* Lam.).

In cultivation as a greenhouse plant in SWEET's time, at the Chelsea Physic Garden. Recently reintroduced from seed sent by Mr. SHIRLEY ATCHLEY from Athens.

Eastern Mediterranean from Sicily and Tunis to Asia Minor.

A charming plant, with small flowers, about 1 inch across, of an exquisite pale pink colour, produced in cymes. The leaves are stalked, rather small, felted, and of a pleasant bluish-grey-green colour. Pot plants at Headley have attained a height of 2 feet in five years from seed. This species has been placed in a separate section on account of its nearly sessile stigma.

It is probably tender. Plants out of doors have succumbed to the severities of the winters of 1927-8 and 1928-9, but it has not yet been tested in milder winters. It possibly likes a chalky soil.

* See p. 38.

† SWEET, t. 90; GROSSES, p. 29. Apparently now lost to cultivation.

‡ See p. 38.

§ See p. 40.

|| See p. 38.

Var. *albiflorus* Pamp.

A white form. At Wadi Msaaba, Tripoli, more frequent than the type (JANCHEN).

For descriptions and figures see SWEET, t. 14; WILLKOMM, "Icones," 28, t. 85; GROSSER, p. 17.

The following hybrids are known :

In nature :

with *C. monspeliensis* = *C. × Skanbergii* Lojac.*

In gardens :

with *C. villosus* = *C. × cymosus* † Dunal.

Stephanocarpoides :

9. *C. varius* Pourret (syn. *C. Pouzolzii* Del.).

In cultivation at Headley from plants collected in the Atlas of Blida, Algeria, in 1929.

France (limited to the Departments of Gard, Aveyron, and Lozère in the foothills of the Cevennes), Catalonia, and Algeria.

The controversy regarding this species is discussed on p. 16.

A much-branched shrub growing to a height of not more than 1½ foot in nature, with bluish-grey leaves not unlike those of *C. crispus*, but less deeply furrowed. The Algerian form I have seen has not the leaves crisped so markedly as WILLKOMM's figure would suggest.

The small white flowers, ¾ to 1 inch across, have petals of the same length as the outer sepals, but smaller than the bracts. The stamens are half as long as the petals, which gives the flower a distinctive appearance. The seeds are larger than those of any other *Cistus*.

Probably of little garden value, but it is possibly fairly or quite hardy, as its Algerian habitat is a centre for winter sports.

For detailed description and figure see WILLKOMM, 32, t. 87; ROUY and FOUCAULT, 1895, vol. ii. p. 261.

No hybrids are recorded.

Stephanocarpus :

10. *C. monspeliensis* L.

Introduced in 1656 and still common in cultivation, usually under its correct name, though I have received it under the names of *C. canariensis*, *C. coeris*, and even from Cyprus as *C. hortus* (nomina nuda). It has the widest natural range of any *Cistus*.

From the Canaries to Tunis, Macedonia, and Cyprus.

It is a plant of elegant habit when well grown, reaching a height of 4 feet, very sticky, with characteristic linear-lanceolate leaves, 3-nerved and stalkless. The white flowers are small, borne in

* See p. 40.

† SWEET, t. 90; GROSSER, p. 29. Apparently now lost to cultivation.

clusters, and though neat they are not so showy as in some of the other species.

It is not so hardy as *C. laurifolius*, *C. populifolius*, and *C. hirsutus*, probably ranking with *C. salvifolius*. Some plants at Headley have survived the two recent severe winters, others have been killed outright or seriously cut. It is a distinct and pleasant species, which should be included in collections, though not one of the best. Seedlings always come true, and BORNET at Antibes never raised a hybrid with it as seed parent. On the other hand, the list which follows shows the freedom with which its pollen fertilizes other species.*

For description and figure see SWEET, t. 27; WILLKOMM, "Icones," 29, t. 86; BEAN, vol. i. p. 347.

The following hybrids are known :

In nature :

with *C. albidus* = *C. × ambiguus* Rouy and Fouc.—Languedoc (possibly also Algeria)

with *C. villosus* ?—Albania and Thessaly (Grosser)

with *C. parviflorus* = *C. × Skanbergii* † Lojacono

with *C. hirsutus* = *C. × platysepalus* ‡ Sweet

with *C. salvifolius* = *C. × florentinus* § Lam.

with *C. populifolius* = *C. × nigricans* || Pourr.

with *C. ladaniferus* = *C. × Loretii* || Rouy and Fouc.

with *C. laurifolius* = *C. × glaucus* ¶ Pourr. (syn. *C. Ledon* Lam.)

and the following triple hybrids :

with *salvifolius* and *populifolius* = *C. × Ponsii* Rouy and Fouc.—France (Dept. of Aude)

with *salvifolius* and *ladaniferus* = *C. × Neyrautii* ** Verguin—France (Dept. of Hérault)

with *ladaniferus* and *laurifolius* = *C. × Hetieri* †† Verguin.

Ledonia :

II. *C. hirsutus* Lamarck.

Introduced about the middle of the seventeenth century and still common in cultivation. Although usually true to name, it is often supplied under the name of *C. × platysepalus* †† and occasionally as *C. acutifolius*.

Spain and Portugal. Naturalized in Brittany, where it originated as a garden escape §§ from Landerneau.

A dense shrub, 3 to 4 feet high, hairy in every part, with leaves up to 2½ inches long and up to ¾ inch wide, broadest near the base and stalkless. The neat white flowers, 1½ inch. in diameter, are formed in terminal clusters. A feature of the flower is supplied by the large heart-shaped sepals, with recurved margins and a tapered

* See also p. 8.

† See p. 40.

‡ See p. 43.

§ See p. 43.

|| See p. 45.

¶ See p. 41.

** See *Bull. Soc. Bot. de France*, vol. lxxi. p. 82.

†† See p. 46.

‡‡ One of its hybrids, see p. 43.

§§ Auct. BONNEMAISON, see *Flore de l'Ouest de la France*, JAMES LLOYD, 1886, p. 43.

point, the character of which is even more pronounced when the plant is in fruit.

It comes next in hardness to *C. laurifolius* and *C. populifolius* and is only badly injured or killed in very severe winters. The freedom with which it flowers makes it a very valuable garden plant. Self-sown seedlings often occur at Headley, and usually come true, though the pollen of *C. hirsutus* frequently fertilizes plants of other white species growing near it.

For detailed description and figures see SWEET, t. 19; WILLKOMM, "Icones," 35, t. 90; GROSSER, p. 19; BEAN, vol. i. p. 346.

Var. *brevifolius* Willkomm. Serra de Cintra, Portugal.

This variety differs from the type in its smaller leaves, up to 1 inch long and $\frac{1}{2}$ inch wide. A plant sometimes supplied under the name of *C. rotundifolius* is probably this variety. Other varieties not in cultivation are recorded.*

The following hybrids are known :

In nature :

with *C. albidus*—Portugal (Daveau)

with *C. monspeliensis* = *C.* \times *platysepalus* † Sweet

with *C. salvifolius* = *C.* \times *obtusifolius* ‡ Sweet

with *C. populifolius* = *C.* \times *laxus* § Aiton

with *C. ladaniferus* = *C.* \times *lusitanicus* || Maund.

Artificially by BORNET at Antibes :

with *C. laurifolius* = *C.* \times *oblongifolius* ¶ Sweet.

12. *C. salvifolius* L.

In cultivation since the middle of the sixteenth century, but not one of the common Cistuses in English gardens.

In all the countries bordering on the Mediterranean, except Tripoli and Tunis, in Spain and Portugal, but not in Madeira and the Canaries.

A compact plant, about 2 feet high, with the neatest flowers of the genus. They are $1\frac{1}{2}$ to $1\frac{3}{4}$ inch across and slightly cup-shaped. Leaves shortly stalked, very variable in size and shape, not exceeding about $1\frac{1}{2}$ inch in length in the varieties in ordinary cultivation, rough to the touch, with prominent net-veining. It differs from the sessile-leaved *C. hirsutus* also in the short down which covers the leaves, the absence of the long hairs of that species, and the smaller non-revolute sepals. The young branches of both are distinctly reddish-brown in colour, but the shorter hairs on those of *C. salvifolius* normally give them a pinker appearance. The flowers in some forms are solitary, in others two or three together.

It is only moderately hardy, comparing with *monspeliensis* in this respect. Though pleasing, especially for the neatness of its flowers, it can therefore perhaps not be classed as a first-rate garden plant.

* See DAVEAU, *Cistindes du Portugal*, p. 28.

† See p. 43.

‡ See p. 40.

§ See p. 41.

|| See p. 47.

¶ Auct. BORNET. GROSSER considers SWEET's *oblongifolius*, t. 67, to be *C. monspeliensis* \times *C. populifolius*.

For description and figure see SWEET, t. 54; WILLKOMM, "Icones," 38, t. 91 and t. 92; GROSSER, p. 20; BEAN, vol. i. p. 348.

The following hybrids are known :

In nature :

- with *C. albidus* = *C. × Albereensis* Rouy and Fouc.—S. France;
and *C. × Gautieri* Rouy and Fouc.—S. France (? Portugal)
- with *C. crispus* = *C. × novus* Rouy and Fouc.—France (dept. of Aude)
- with *C. monspeliensis* = *C. × florentinus* * Lam.
- with *C. hirsutus* = *C. × obtusifolius* † Sweet
- with *C. populifolius* = *C. × corbariensis* ‡ Pourr.
- with *C. ladaniferus* = *C. × Verguinii* § Coste and Soulié
- with *C. laurifolius* = *C. × Costei* || Camus
- with *Halimium umbellatum* = *Halimiocistus × Sahucii* ¶ (Coste and Soulié) Janchen

and the following trispecific hybrids :

- with *monspeliensis* and *populifolius* = *C. × Ponsii* Rouy and Fouc.—France (dept. of Aude)
- with *monspeliensis* and *ladaniferus* = *C. × Neyrautii* Verguin.—France (Dept. of Hérault).

In gardens :

- with *Halimium ocymoides* or *H. formosum* ? = *Halimiocistus × wintonensis* (p. 49).

Artificially at Antibes :

- with *Halimium halimifolium* = *Halimiocistus × heterogenus* (Bornet) Janchen

and various triple *Cistus* hybrids.

Numerous varieties have been recorded and described, for which see WILLKOMM's "Icones," GROSSER, and ROUY and FOUCAULT. I have not yet sufficient material for estimating either their distinctness or their garden value.

13. *C. populifolius* L.

Cultivated since 1656, but a relatively scarce plant. The true plant can now be obtained from several nurserymen, but a few years ago other plants were often supplied under this name, and care should even now be exercised by those desiring this species.

South France, Spain and Portugal, and Morocco in differing forms.

A very vigorous grower, reaching a height of 4 feet at Headley, though according to BEAN up to 7 feet in other gardens; at once distinguished from all other species by its large long-stalked heart-shaped leaves bright green on both sides. The form normally found in gardens here has leaves up to 3½ inches long and 2½ inches in the widest part. The flowers, 2 inches across, are produced in 2- to 5-flowered clusters.

* See p. 43.

§ See p. 48

† See p. 40.

|| See p. 48.

‡ See p. 41.

¶ See p. 49.

A very valuable garden plant, and the hardiest *Cistus* at Headley after *C. laurifolius*.

The systematic writers divide this plant into two forms, *C. marianus* (the Spanish form) and *C. narbonneensis* (the South-West France form), apparently accepting WILLKOMM's differentiation, based on length of peduncles and size of sepals. The plants I have collected in the South of Spain and round Narbonne, and the Herbarium specimens I have examined do not correspond with WILLKOMM's descriptions, and the characters he has selected are not sufficiently constant to enable any differentiation to be made based on them. The question whether the French and Spanish plants are different therefore requires re-examination.

For descriptions and figures see SWEET, t. 23; WILLKOMM, "Icones," 40, t. 94; GROSSER, p. 22; ROUY and FOUCAULT, vol. ii. p. 270; BEAN, vol. i. p. 348.

Var. *lasiocalyx* Willkomm.

Differs from the type in its much larger flowers, 3 inches across, its broader leaves very wavy at the margins, and its larger sepals covered all over with long white hairs.

A much finer plant than the type, but unfortunately distinctly more tender, plants having been killed at Headley in the winter 1927-8, though not the following year.

South Spain, South Portugal, and Morocco.

The following hybrids are known:

In nature:

with *monspeliensis* = *C. × nigricans* * Pourr.

with *hirsutus* = *C. × latus* † Aiton

with *salvifolius* = *C. × corbariensis* ‡ Pourr.

with *ladaniferus* = *C. × Aguilari* Pau—Spain and Morocco

and the following triple hybrid:

with *monspeliensis* and *salvifolius* = *C. Ponsii* Rouy and Fouc.—France (Dept. of Aude).

Artificially at Antibes:

the whole of the above, including *C. Aguilari*, described by GARD as being the finest of BORNET's hybrids.

Ladanium:

14. *C. ladaniferus* L.

Introduced in 1629 and in general cultivation. *C. × cyprius*, its hybrid with *C. laurifolius*, is sometimes supplied as *ladaniferus* in error by nurserymen.

South France [St. Chinian (Dept. of Aude) and Fréjus (Dept. of Var) only], Spain, Portugal, Algeria, and Morocco.

The stickiest of the genus and one of the sources of ladanum gum, the odour of which permeates the plant and, on sunny days, the air

* See p. 45.

† See p. 41.

‡ See p. 41.

near it. In nature the larger plants, which tend to become leggy, are as much as 7 feet high, in our gardens probably 5. The lanceolate leaves, up to 4 inches long, are dark shiny green above and felted beneath. The white flowers are solitary and very large, up to 4 inches across. In the type the petals are marked at the base with a brown-red blotch, producing a fine effect in the best forms. The pure white form (var. *albiflorus*) is also very beautiful and is found with the type. The seed-vessels have 10 cells, instead of the usual 5.

One of the most beautiful of the genus, but unfortunately distinctly tender, most plants out of doors being killed in severe winters and often suffering serious injury in milder ones.

For description and figures see SWEET, t. 84; WILLKOMM, "Icones," 43, t. 96; GROSSER, p. 23; and BEAN, vol. i. p. 346. The *Bot. Mag.* figure, t. 112, under the name of *C. ladaniferus* is *C. × cyprius*.

Var. *albiflorus* Dunal (syn. var. *immaculatus* hort.).

See above. SWEET, t. 1.

The following hybrids are known :

In nature :

with *C. monspeliensis* = *C. × Loretii* * Rouy and Fouc.

with *C. hirsutus* = *C. × lusitanicus* † Maund

with *C. salvifolius* = *C. × Verguinii* ‡ Coste and Soulié

with *C. populifolius* = *C. × Aguilari* Pau—Spain, Morocco

with *C. laurifolius* = *C. × cyprius* § Lam.

and the following triple hybrids :

with *monspeliensis* and *salvifolius* = *C. × Neyrauti* Verguin—France (Dept. of Hérault)

with *monspeliensis* and *laurifolius* = *C. × Hetieri* || Verguin.

In gardens :

with *C. villosus* = *C. × purpureus* ¶ Lam.

Artificially :

at Antibes by BORNET and again by POIRAULT with *C. albidus*.

15. *C. laurifolius* L.

Introduced 1731 and very common in gardens.

Spain, Portugal, South France, Morocco, Asia Minor.

The tallest *Cistus* in gardens, up to 8 feet high. Unmistakable for its stalked ovate dark green glaucous leaves felted beneath, and numerous white flowers 2½ inches across, produced in a cymose panicle. Distinguished from *C. × cyprius*, its hybrid with *C. ladaniferus*, by its broader, longer-stalked leaves and smaller flowers.

The hardiest of the whole genus and a very valuable garden plant. It should be raised from seed. Cuttings are difficult to strike.

For description and figures see SWEET, t. 52; WILLKOMM, "Icones," 41, t. 92; GROSSER, p. 24; BEAN, vol. i. p. 346.

* See p. 45.

§ See p. 48.

† See p. 47.

|| See p. 46.

‡ See p. 48.

¶ See p. 38.

The following hybrids are known :

In nature :

with *monspeliensis* = *C. × glaucus* * Pourr. (syn. *C. Ledon* Lam.).

with *salvifolius* = *C. × Costei* † Camus

with *ladaniferus* = *C. × cyprius* ‡ Lam.

and the following triple hybrid :

with *monspeliensis* and *ladaniferus* = *C. × Hetieri* § Verguin.

The plant recorded by POURRET under the name of *C. longifolius* as occurring at Gibraltar, said by TIMBAL-LAGRAVE and ROUY and FOUCAULT to be a hybrid of *C. laurifolius* and *C. crispus*, cannot be this hybrid, as *C. laurifolius* is not found in this area. POURRET's description mentions spotted petals, so that the plant is clearly a hybrid of *C. ladaniferus*, possibly with *C. salvifolius*.||

In gardens :

with *C. villosus* ? = *Cistus* 'Silver Pink.' ¶

Artificially by BORNET at Antibes :

with *C. hirsutus* = ? *C. × oblongifolius* ** SWEET.

Var. *atlanticus* Pitard. Morocco.

Introduced from seed sent by M. JAHANDIEZ and in cultivation at the Royal Botanic Garden, Edinburgh, and at Headley.

It differs from the type in its smaller leaves and less pointed sepals.

Of less garden value than the type, and apparently less hardy.

Halimioides :

16. *C. sericeus* Munby (syn. *C. Munbyi* Pourret).

One of the two endemic Algerian species, and like the other (*C. heterophyllus*), remarkable for its twiggy habit. I can find no trace of its ever having been in cultivation here, but I now have a few small plants collected near Algiers in 1929, at a station where it may soon disappear owing to the rapid extension of vineyards.

Algeria, local.

This species is remarkable for the long white silky hairs, which cover the flower-stalks, buds, and calyx. The leaves are linear, up to 1 inch long, the plant compact, twiggy, and not exceeding 1½ foot in height, with small white flowers.

It is too early to express an opinion as to its garden value or hardness.

For description and figure see WILLKOMM, "Icones," 45 to 97 ; GROSSER, p. 25.

No hybrids are known of this or the other two species of the section *Halimioides* Willk.

* See p. 45.

† See p. 48.

‡ See p. 48.

§ See p. 46.

|| See under *C. × Verguinii*, p. 48.

¶ See p. 40.

** Auct. BORNET. GROSSER considers SWEET's *oblongifolius*, t. 67, to be *C. monspeliensis* × *C. populifolius*.

17. *C. rosmarinifolius* Pourret (syn. *C. Chusii* Dunal).

In cultivation in SWEET'S time, and now not uncommon in gardens. It should be noted that *Halimium* (*Helianthemum*) *rosmarinifolium*, which might be confounded with it when ordering from catalogues, belongs to the neighbouring genus and has yellow flowers. It is a synonym for *Halimium libanotis*.

Spain, Portugal, Northern Africa, Sicily.

A dwarf plant of bushy rounded habit, under a foot high, with small linear-lanceolate leaves, not so dark as those of *C. sericeus* and *C. Bourgaeanus*, up to an inch long. Its small neat white flowers are very freely produced in clusters, and my plants at Headley have a much longer flowering period than any * other species.

It ranks for hardiness next after *C. laurifolius* and *C. populifolius*, and is an excellent dwarf bush for gardens, including rock gardens.

For description and figures see SWEET, t. 32; WILLKOMM, "Icones," 46, t. 98; GROSSER, p. 25.

Two variations from the type have been described, neither of them are in cultivation.

18. *C. Bourgaeanus* Cosson. (Fig. 10.)

The only plants in cultivation of which I have knowledge originated from those I collected in the South of Spain in 1925.

South Portugal and South-West Spain, uncommon.

A small plant, not exceeding 1½ foot in height, of straggly habit. The leaves are linear, dark green, up to 2 inches long in cultivation, the flowers small, white, often tipped with pink.

A pleasant little plant, but of no striking garden value. Its hardiness has not yet been tested.

For description and figures see WILLKOMM, "Icones," 48, t. 98; GROSSER, p. 27.

HYBRIDS.

C. × pulverulentus Pourret (syn. *C. × Delilei* Burnat).

[*C. albidus* L. × *C. crispus* L.]

In general cultivation under the names of 'Sunset,' 'Warley Rose,' and (erroneously) *crispus* and *cymosus*.

A natural hybrid occurring freely where found.

France, Spain, and Portugal.

Plants ordinarily supplied under the name of *C. × Delilei* are not this hybrid, but are a poor form of *C. villosus*.

A beautiful plant, of bushy much-branched habit, growing to a height of slightly over 2 feet. The flowers are of a good deep colour, not quite so pure in tone as *C. crispus*. The leaves are larger, greyer, and not so wrinkled and less crisped than those of *C. crispus*, though lacking the felted smoothness of *C. albidus*. It produces seed freely,

* See p. 3.



FIG. 10.—CISTUS BOURGAEANUS.

the seedlings tending to revert towards one or other of the parents. It appears to be slightly hardier than either parent.

It is a valuable garden plant, probably the best of the group of pink species and their hybrids *inter se*.

For detailed description see ROUY and FOUCAULT, "Flore de France" (1895), vol. ii. p. 258.

C. × canescens Sweet.

[*C. albidus* L. × *C. villosus*.]

A natural hybrid, recorded from Algeria.* In cultivation in SWEET's time, no doubt originating as a garden hybrid and still met with under this and other names.

Algeria (Cosson).

Seed of *C. albidus* from gardens where *C. villosus* is also grown often produces seedlings of this hybrid.

It resembles *albidus* in habit, but the leaves are greener in colour, not so felted, rather narrower and more pointed and usually wavy.

Though it flowers more freely than *C. albidus* the general effect is less pleasing. Its hardiness is about the same. A good form is in cultivation at Kew under the name of *C. canescens floribundus*.

For descriptions and figure see SWEET, t. 45 (also possibly t. 44 as *C. incanus*); GROSSER, p. 14; BATTANDIER and TRABUT, *loc. cit.*

Var. *albus* Warburg var. nov.

A pure white form raised at Headley from seed of a pink *C. canescens* whose seed parent was *C. albidus albus*. It is nearer to *albidus* than *villosus*.

C. × crispatus Bornet. (Fig. 11.)

[*C. crispus* L. ♀ × *C. villosus* var. *creticus* (L.) Boiss. ♂]

A hybrid produced artificially at Antibes by BORNET, who also produced the inverse cross and crosses between *C. crispus* and some of the other varieties of *C. villosus*. The present hybrid was re-created by Prof. POIRAULT at Antibes, to whom I am indebted for it.

It is prostrate and curiously straggly in habit, no doubt owing to the influence of *C. crispus*, and has a flower of very pleasing pure colour, somewhat paler than *C. crispus*.

C. × purpureus Lam.

[*C. ladaniferus* × *C. villosus*.]

A garden hybrid first described by LAMARCK in 1790 and common in gardens already in SWEET's time.

The best form is of a warm rosy-red with a conspicuous brown blotch at the base of each petal, producing a very beautiful effect. The oblong-lanceolate leaves, up to 2 inches long, do not resemble those of *ladaniferus* in colour or surface. It is of good bushy habit, about 4 feet high.

* BATTANDIER, *Supplém. au phanerogames Tenes, Montenolle herbier Cosson*.



FIG. 11.—*CISTUS X CRISPATUS*.

It is not one of the hardiest *Cistus*, but its garden value is very great indeed, and a fine effect is gained by massing it.

For description and figure see SWEET, t. 17; GROSSER, p. 28; BEAN, vol. i. p. 348.

BORNET, who produced hybrids between *ladaniferus* and several varieties of *C. villosus*, identifies his *C. ladaniferus* ♀ × *C. villosus* var. *creticus* ♂ as *C. × purpureus*.

The plant described above is, of course, with the spotted form of *ladaniferus*, but Antibes has also obtained a cross with the unspotted form. This plant, when introduced or re-created here, should also possess fine qualities.

Cistus 'Silver Pink.'

[*C. laurifolius* × *C. villosus*.]

A plant introduced by Messrs. HILLIER of Winchester,* who are unaware of its exact parentage. One of its parents is clearly *C. laurifolius*, and I have little doubt that the other is some form of *C. villosus*.

The pale pink medium-sized flower and the leaves resembling those of *C. laurifolius*, though smaller and greyer, make it unmistakable. It does not show promise of being a tall plant.

It is considerably less hardy than *C. laurifolius*, but it is a distinctive and useful garden plant.

C. × Skanbergii Lojaccono.

[*C. parviflorus* × *C. monspeliensis*.]

A natural hybrid recorded from the Island of Lampedusa between Sicily and Tunis, and recently from Athens. Established at Headley from the latter station from cuttings sent by the discoverer, Mr. SHIRLEY ATCHLEY.

Lampedusa and Greece.

A most attractive plant forming well-balanced bushes with small pale pink flowers similar to those of *C. parviflorus*, sometimes bleaching during the day and finishing white. The leaves have the shape of those of *monspeliensis*, though slightly broader and blue-grey in colour and only slightly viscous.

Of its hardiness I can as yet say nothing.

C. × obtusifolius Sweet.

[*C. hirsutus* × *C. salvifolius*.]

A natural hybrid. In cultivation in SWEET's time and still common in gardens.

Portugal.

A dwarf bushy shrub, up to 1½ foot in height. The oblong leaves resemble those of *C. salvifolius* in colour and rough surface, but they are longer, more tapered at the base, and sessile. The medium-sized white flowers are very freely produced in clusters.

* Award of Merit, R.H.S., 1919.

A useful dwarf shrub, in hardiness intermediate between its parents.

For description and figure see SWEET, t. 42; GROSSER, p. 19.

Var. angustifolius.

A taller, less bushy shrub with narrower leaves, 3-nerved and without the rough surface of *C. salvifolius*.

Of no particular merit for gardens.

C. × laxus Aiton (syn. *C. Merinói* Pau). (Fig. 12.)

[*C. hirsutus* × *C. populifolius*.]

A natural hybrid in cultivation since the early part of the nineteenth century, probably from plants originating as garden hybrids. I have received it under the name *C. lanuginosus* from a nursery, and it has also occurred accidentally at Headley in quantity from seed of an isolated *C. populifolius* growing near *C. hirsutus*. Also produced artificially at Antibes with both species as seed-parents. Plants originating from the Antibes cross *C. hirsutus* ♀ × *C. populifolius* ♂ are rather different from the Headley inverse hybrid, though BORNET'S records of his inverse crosses show no differences.

Spain.

GROSSER is in error in giving *C. × laxus* as a synonym for *C. × nigricans* (q.v.), as is pointed out by JANCHEN.*

A shrub up to 4 feet high of rather untidy habit, with a tendency for the young branches to extend floppily round the plant. The leaves are ovate-lanceolate, blackish when old. Flowers medium-sized, the calyces showing markedly the influence of *C. hirsutus* (q.v.).

In hardiness it is comparable with *C. hirsutus*, but it is not such a valuable plant for gardens.

For description and figure see SWEET, t. 12.

A plant received from Messrs. SMITH of Newry (under the name of *C. recognitus*) is, I believe, almost certainly this hybrid. It is similar to the artificial hybrids received from Antibes, but it forms a large rounded bush of very neat and compact habit, very floriferous, which makes it quite a first-rate garden plant. It is quite hardy with me. It differs also from the common form described above in the waviness of the leaves, which do not darken materially with age, characters shared by my Antibes plants.

I think it is worthy of a special name and suggest *Cistus laxus*, Newry form.

C. × corbariensis Pourret.

[*C. salvifolius* × *C. populifolius*.]

A natural hybrid. In cultivation in SWEET'S time and common in gardens. It is usually correctly named, but I have had it supplied under the name of *C. × hybridus* and erroneously as *C. salvifolius*.

* ENGLER, *Natürlichen Pflanzenfamilien*, vol. xxi.

S. France.

A shrub of bushy habit, up to 4 feet in height. The leaves resemble those of *C. populifolius* in shape and colour, but are much smaller, not exceeding 2 inches in length. The white flowers, which



FIG. 12.—*CISTUS* × *LAXUS*.

are borne in clusters of from one to three, are $1\frac{1}{2}$ inch across, less neat than those of *C. salvifolius*.

A valuable free-flowering *Cistus* of about the same hardiness as *C. populifolius*. At Headley it has been injured in severe winters, but BEAN states that at Kew it survived the winter of 1895-6 which killed all other *Cistuses* at Kew except two.

C. × corbariensis produces fertile seed, which no doubt accounts for the variation in the appearance of the leaves of different plants in circulation.

For description and figures see SWEET, t. 8; GROSSER, p. 22; BEAN, vol. i. p. 344.

Var. *australis* Font-Quer.

[*C. salvifolius* × *C. populifolius* var. *lasiocalyx*.]

Natural hybrid.

Morocco.

? *C.* × *platysepalus* Sweet. (Fig. 13.)

[*C. hirsutus* × *C. monspeliensis*.]

A natural hybrid, also produced artificially at Antibes.

Portugal (Daveau).

I quote, with some reserve, GROSSER'S and JANCHEN'S naming of this hybrid as being the plant figured by SWEET as *C. platysepalus*.

A plant received from the Royal Botanic Garden, Edinburgh, who obtained it from the Botanic Gardens of Krakowie, Austria, corresponds to BORNET-GARD'S description of this cross, which, as with my plant, had no stamens visible to the naked eye. It differs somewhat from an artificial hybrid I have received from Antibes from Prof. POIRAULT, which is not stamenless.

The plant supplied by nurserymen as *C. platysepalus* is, in my experience, only *C. hirsutus*.

Though curious it is of little value for gardens.

C. × *florentinus* Lam. (syn. *C. olbiensis* and *C. porquerollensis* Huet and Hanry, *C. feredjensis* Battandier).

[*C. salvifolius* × *C. monspeliensis*.]

A natural hybrid; also produced artificially at Antibes, always with *C. salvifolius* as seed-parent.

France, Corsica, Portugal, Algeria, and Greece.*

The plant stocked by most nurserymen under this name, though a useful free-flowering dwarf *Cistus*, is not true to name; it is probably a triple or even quadruple hybrid. The true plant is in cultivation at Kew, and I have plants at Headley collected in France in 1929 and also sent me from Antibes.

The forms vary according to the form of *salvifolius* responsible.

Its leaves are shorter than those of *monspeliensis* and lanceolate rather than linear, with the rough surface and net-veining of *salvifolius*, often shortly 3-nerved at the base. Flowers intermediate in size between the parents.

The Kew form is a neat low-growing free-flowering *Cistus* without any very distinctive character. My collected plants are not yet established.

For description and figure see SWEET, t. 59 (bad plate); and GROSSER, p. 30.

* ATCHLEY, 1927.

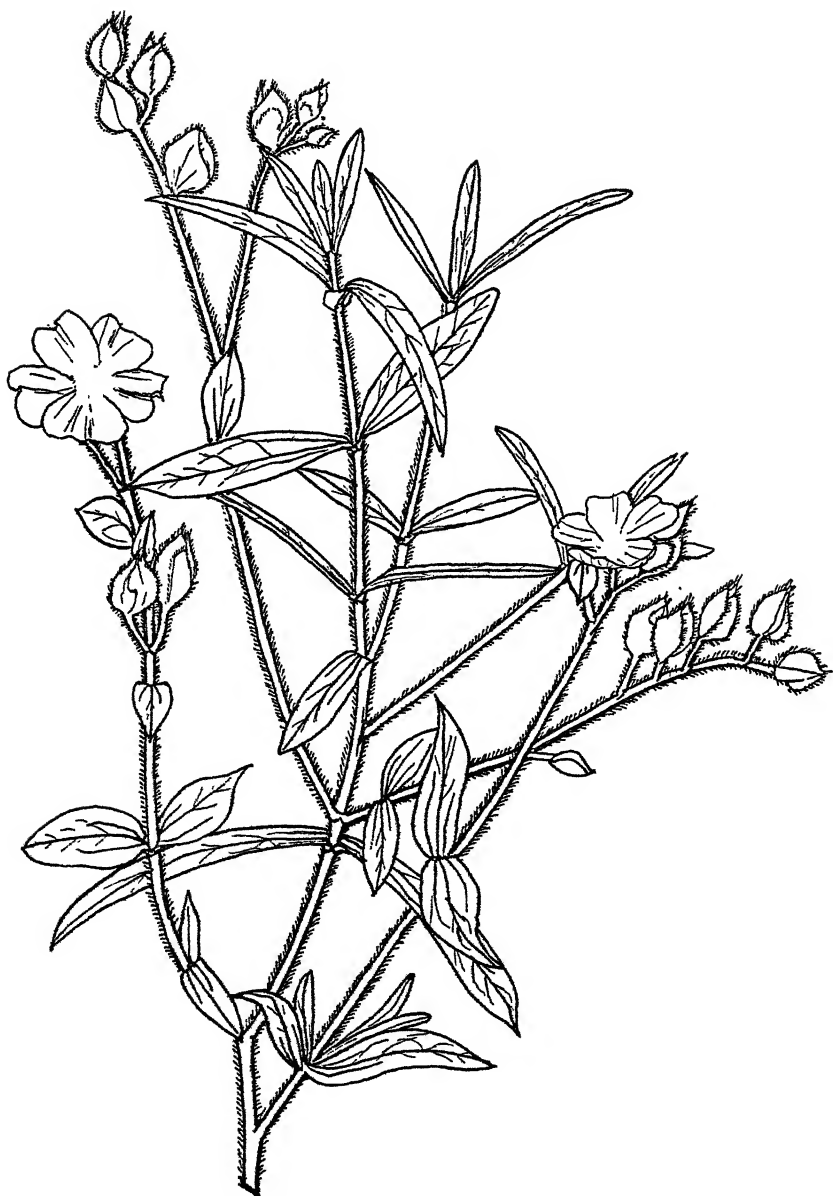


FIG. 13.—*CISTUS* × *PLATYSEPALUS*.

C. × nigricans Pourret (syn. *C. longifolius* Lam.).

[*C. populifolius* × *C. monspeliensis*.]

A natural hybrid, not in cultivation up to the present. I am endeavouring to establish it from plants collected in 1929. Also produced artificially at Antibes.

France (Depts. of Hérault and Aude), Spain.

A shrub up to 3 feet high, very sticky, with ovate-lanceolate leaves, glabrous above, described as very floriferous and as bearing fertile seed.

I cannot yet estimate its value as a garden plant.

For description see ROUY and FOUCAULT, "Flore de France," vol. ii. p. 271.

C. × Loretii Rouy and Fouc.

[*C. ladaniferus* × *C. monspeliensis*.]

A natural hybrid which I have found in France; also produced artificially at Antibes and at Headley, where it also arose accidentally amongst a batch of *ladaniferus* seedlings. The *C. × Loretii* of gardens (*q.v.*) is not this plant.

France and Algeria.

A shrub of erect habit, up to 4 feet high, with linear-lanceolate leaves intermediate in every respect between those of the parents. Flowers nearer to those of *C. monspeliensis* in size, with a spot smaller than that of *C. ladaniferus* in size, but of the same intensity of colour.

Var. *albiflorus* Rouy and Fouc.

Differs from the type in the absence of the spot on the petals.

I have only seen the unspotted form, which is of no particular garden value.

For description see ROUY and FOUCAULT, "Flore de France," vol. ii. p. 279; GROSSER, p. 28.

C. × glaucus Pourr. (syn. *C. Ledon* Lam. and *C. recognitus* Rouy and Fouc.).

[*C. laurifolius* × *C. monspeliensis*.]

A natural hybrid which I have found in France. Also created artificially at Antibes, whence plants at Headley have also been received.

France (Depts. of Hérault, Aude, and Pyrénées-Orientales).

Of erect growth, the sticky scented leaves resembling those of *C. laurifolius* in surface, but paler, dull green, lanceolate, wavy, sometimes curving at the tip asymmetrically. Flowers, intermediate in size between the parents, produced in many-flowered clusters.

Probably hardy. I can say nothing yet as to its garden value. WILLKOMM describes it as "elegans."

For description and figure see WILLKOMM, "Icones," 32, t. 88 ; GROSSER, p. 28 ; ROUY and FOUCAULT, "Flore de France," vol. ii. p. 275.

Var. *atlanticus* Maire.

[*C. laurifolius* var. *atlanticus* Pitard \times *C. monspeliensis*.]
Morocco.

C. \times Hetieri Verguin.

[*C. ladaniferus* \times *C. laurifolius* \times *C. monspeliensis*.]

A natural hybrid first recorded in 1926,* and which arose



FIG. 14.—*CISTUS \times LUSITANICUS* var. *DECUMBENS* (LORETII hort.)

accidentally at Headley in a batch of seedlings of *C. \times cyprius*. I have not found the wild plant.

France (St. Chinian, Dept. of Hérault).

My Headley plant is intermediate in appearance between *C. \times Loretii* (Rouy and Fouc.) and *C. \times glaucus* (q.v.). The leaves are lanceolate, rather wavy at the margins, narrower than those of *C. \times cyprius*, of a paler green and slightly rugose. The flower is unspotted ; natural hybrids are sometimes spotted.

Of interest as being a triple hybrid, but of no particular value as a garden plant.

* In *Bull. Soc. Bot. de France*, vol. lxxiii. (1926), "Un nouvel hybride ternaire de Cistes."

C. × lusitanicus var. *decumbens* Maund [syn. *C. × Loretii* hort. (non Rouy and Fouc.)]. (Figs. 8, 14.)

[*C. ladaniferus* × *C. ? hirsutus*.]

A garden hybrid long in cultivation supplied under the names of *C. Loretii* or *C. lusitanicus*. The name *C. Loretii* was given to it in error in the *Bot. Mag.* t. 8490, but the garden plant is quite a different hybrid from that found by LORET at St. Chinian and described by ROUY and FOUCAULT,* which is a hybrid of *C. ladaniferus* and *C. monspeliensis*.

A spreading bushy plant 3 to 4 feet high, very floriferous. The upper surface of the bright green oblong-lanceolate leaves has a peculiarly smooth shiny appearance, unlike those of *ladaniferus*, and perhaps best described as being like a water surface. The leaves are 3-nerved and sessile, up to 2½ inches long. The flowers, 2 to 2½ inches across, borne in clusters of from 3 to 5, have a handsome reddish-brown spot at the base of each petal.

At Headley it is sometimes cut in winter, but BEAN gives it as one of the three hardiest at Kew. A valuable garden plant.

C. ladaniferus is clearly one parent, and the character of the plant, notably in its sessile 3-nerved leaves, forces the conclusion that the other parent must be *C. hirsutus*. The garden plant differs, however, from the artificial hybrids created at Antibes, notably in the appearance of the leaf surface referred to above.

The leaves are often spotted by a fungus in our gardens.

For description and figure see *Bot. Mag.* t. 8490, and BEAN, vol. i. p. 347 (both under *C × Loretii* Rouy and Fouc.); MAUND'S "Botanic Garden, 1825-1851," vol. ix. t. 799.

C. × lusitanicus Maund [syn. *C. × recognitus* hort. (non Rouy and Foucault)]. (Fig. 9.)

A plant bearing some resemblance to *C. × Loretii* hort., but differing in various respects. The habit is less spreading, the leaves are up to 2½ inches long and lanceolate rather than oblong-lanceolate and have not the shiny surface of the *Loretii* of gardens; they are also greyer beneath. The spot on the petals is less solid and slightly smaller, often becoming reduced to five reddish-brown lines as the season advances. Also a valuable garden plant.

This plant cannot be the *C. × recognitus* of Rouy and Fouc. which is the hybrid of *C. laurifolius* and *C. monspeliensis* (see *C. × glaucus*), neither of them spotted species. It would appear to be also a hybrid of *C. ladaniferus* and *C. hirsutus*.

BORNET'S hybrids with this parentage differed materially in leaf character *inter se*, the reciprocal hybrids also differing from one another, both in external and anatomical characters, so that such a variation in different forms is not improbable.

* See p. 45.

I have not yet been able to undertake a microscopical examination of the group of plants discussed above. Such an examination should materially assist in a definite determination of the question.

For figure see MAUND'S "Botanic Garden, 1825-1851," vol. vii. t. 649. There is no description, but the figure and comment clearly indicate this plant.

The natural hybrid *C. hirsutus* × *C. ladaniferus* is found in Portugal.

C. × Verguinii Coste.

[*C. salvifolius* × *C. ladaniferus*.]

A natural hybrid, first recorded in 1908* at a station where I found it in 1929. Also created artificially at Antibes, whence I have plants in cultivation.

France (St. Chinian, Dept. of Hérault), Spain (Barcelona).

My Antibes plants are of erect habit with dull green oblong-lanceolate leaves up to $2\frac{1}{4}$ inches long, 3-nerved at the base. The basal spot on the petals is not so solid as that of *ladaniferus*, resembling that of *C. recognitus* (of gardens). For description of the natural hybrid, which I have not seen in flower, but which was similar in leaf and habit, see COSTE'S description.*

Var. *albiflorus* Coste.*

The unspotted form, of which I also have plants from Antibes. France (St. Chinian, Dept. of Hérault), Spain (Barcelona).

C. × Costei Camus.

[*C. salvifolius* × *C. laurifolius*.]

A natural hybrid which I have found in France; also created artificially at Antibes, whence plants at Headley have been received.

France (Depts. of Aveyron, Gard, and Hérault).

A robust plant, much taller than *C. salvifolius*, with bright green, pointed ovate-stalked leaves, nearly as rugose as those of *salvifolius*, not sticky. Flowers described as being in a lax few-flowered cluster. I have not yet seen the natural hybrid in flower. The artificial hybrid, which has larger darker leaves, has contorted irregular flowers, though the leaf production is perfectly healthy.

Probably hardy; I can say nothing yet of the garden value of the natural hybrid. The artificial plant has none.

For description see ROUY and FOUC., "Flore de France," vol. ii. p. 277 (under *C. × Costei*; see also *C. × Pechii*, loc. cit.); GROSSER, p. 29.

C. × cyprius Lamarck (syn. *C. × Souliei* Coste).

[*C. ladaniferus* × *laurifolius*.]

A natural hybrid, but plants in ordinary cultivation since SWEET'S time are probably garden hybrids. The first record of the discovery

* Bull. Soc. Bot. de France, vol. lv. (1908), p. 472.

of the natural hybrid is that of COSTE * in 1908, who named it *C. × Souliei* after its co-discoverer. It is common in gardens, but is still occasionally supplied as *C. ladaniferus*.

France (St. Chinian, Dept. of Hérault).

A vigorous plant up to 8 feet high, with lanceolate leaves up to 4 inches long, very glaucous, blue-green, becoming more silvery in frosty weather. The flowers, which are produced in clusters, are about 3 inches across, with a handsome red-brown spot at the base of the petals, not so large as that normally found on *C. ladaniferus*, the parent from which it is derived. Intermediate between the parents (*q.v.*).

An excellent and valuable plant and one of the hardiest. It very occasionally produces fertile seed, in capsules of 5 to 7 cells, but never as many as the 10 of *C. ladaniferus*.

For description and figure see SWEET, t. 39; GROSSER, p. 25; BEAN, vol. i. p. 345.

Var. *albiflorus* † Verguin.

A natural hybrid in cultivation under the names of *C. × cyprius albus* and *immaculatus* from plants of unknown origin, probably garden hybrids.

France (St. Chinian, Dept. of Hérault).

Differs from the type in the absence of the spot. My plants at Headley do not appear to be so robust as the type. The absence of the spot deprives it of a good deal of the attraction of the typical form, and to my taste it is also inferior to *C. laurifolius* and *C. ladaniferus albiflorus*.

BIGENERIC HYBRIDS.

Halimiocistus × Sahucii (Coste and Soulié) Janchen.

[*Cistus salvifolius × Halimium umbellatum*.]

A natural hybrid, first recorded in 1911 ‡ and collected by me at its original locality in 1929.

France, near St. Pons (Dept. of Hérault) and near St. Etienne-Vallée-Française (Lozère).

A curious little plant, with small, linear leaves, like those of *H. umbellatum*, but larger, and with the colour and rough surface of *C. salvifolius*. The plants I found were very dwarf, but the discoverers give the height as from 30 to 80 cm. The flowers are described as being intermediate between the parents in size and arrangement, and the plants as being always sterile.

For COSTE's and SOULIÉ's detailed description see reference below.

Halimiocistus × wintonensis (syn. *Cistus wintonensis*).

[? *Cistus salvifolius × Halimium* ?]

A garden hybrid, introduced by Messrs. HILLIER of Winchester in 1926. They are unaware of its exact parentage.

* *Bull. Soc. Bot. de France*, vol. lv. p. 472.

† VERGUIN in *Bull. Soc. Bot. de France*, vol. lxxi. (1924).

‡ *Bull. Soc. Bot. de France*, vol. lviii. (1911).

The leaves resemble those of *C. salvifolius*, which has produced two other bigeneric hybrids. The white petals have a yellow blotch at the base, and a very large and beautiful plum-brown spot beyond, which suggests the probability of the parentage of either *H. ocymoides* (syn. *H. algarvense*) or *H. formosum*.

It is a low-growing plant with small greyish leaves, a little difficult to manage, but for its great and distinctive beauty it should be included in every collection. It is not easy to strike from cuttings.

RESEARCHES ON ARTIFICIAL HYBRIDIZATION OF CISTUS OBTAINED
BY M. EDOUARD BORNET. FIRST MEMOIR. UNPUBLISHED
NOTES AND EXPERIMENTAL RESULTS PUBLISHED BY GARD.

PREFACE.

It was in 1860 that M. EDOUARD BORNET began his experiments with hybridizing the genus *Cistus* at the Villa Thuret at Antibes. They were continued until 1875. The species used for crossing and all the individual hybrids were preserved with great care in a herbarium of thirty-six voluminous packets. It was a great honour which M. EDOUARD BORNET did me when he confided to me the study of material of inestimable scientific value. I have had, in addition, at my disposal his notes and records of experiments, from which I have extracted the material for this first memoir, which is a kind of introduction to my own researches. In my final remarks I have sought to deduce from these experiments the general results which emerge.

I shall study later, in addition to the species, the anatomic structure of the exterior characters of the different classes of hybrids. I must here express my gratitude to M. EDOUARD BORNET and M. SAUVAGEAU. I am indebted to them for enabling me to pursue these researches under conditions they have facilitated by all the means in their power.

* * * * *

CHARACTER OF THE FLOWER OF CISTUSES; FERTILIZATION, TECHNIQUE
AND HYBRIDIZING.

The Genus *Cistus* offers a combination of conditions particularly favourable for researches relating to hybridity. The species cross easily with one another, as is evidenced by the numerous natural hybrids which are known in gardens and in nature. The species are sufficiently varied to offer very differing degrees of affinity. Some are so closely related that they are regarded simply as varieties; others, on the other hand, are sufficiently distinct to justify the classification into sections of the genus. It is therefore possible to vary the experiments very considerably, and to obtain hybrids from plants very near to one another or very different both in appearance and in structure. The flowers are large and wide open. The stamens, although numerous, are easy to remove before the emission of their abundant pollen. The seeds are numerous in each capsule and germinate without difficulty. The plants live for a number of years, which allows easy comparison of the descendants amongst one another and the parents from which they are descended. Finally, it is possible in consequence of their small size to preserve all the individual plants from successive sowings.

Thanks to the resources of every kind which M. BORNET placed at my disposal, I have been able to undertake and continue for more than ten years researches on *Cistus* hybrids.

The flower of *Cistus* has a great deal of resemblance to that of the Wild Rose. At the centre is a large bundle of stamens of a bright yellow which surrounds the ovary. The corolla is white or purplish with different shades which approach more or less to the particular tint of the Mallow flower. The species with white flowers form a distinct group from those whose flowers are pink. When I have to designate these groups I shall make use of the expression "white *cistus*" or "red *cistus*." These terms are those which Mr. WILLKOMM in his classic work on the *Cistuses* * has given to the two principal sections established by him for the genus *Cistus*.

* WILLKOMM, *Cistinearum orbis veteris descriptio monographica*, 1846.

Flowering takes place in April or May. It lasts about three weeks for each species. The plants are covered in the morning with a multitude of flowers, of which the abundance compensates for the shortness of duration. The individual flowers are very fleeting. When the plants are in sunshine the petals detach themselves and fall about the middle of the day. In the shade, or when the sky is overcast, the flowers last longer and even persist to the evening. In addition, there are notable differences in the degree of duration of the flowers between species and species. *C. sericeus* and *C. albidus* lose their corollas very quickly. *C. ladaniferus*, on the other hand, often retains it for two days.

The flowers open in the morning at a very early hour. In general the red *Cistus* opens before the white. Amongst the red *Cistus* seems to be a certain relation between the colour of the corolla and the time at which the flowers open. *C. albidus* and *C. incanus*, the petals of which have a violet tinge, often open before the sun rises; *C. villosus* and *C. creticus* come next; *C. crispus*, the flower of which is of the brightest red and also more rosy than all of the others, is also the latest. A similar unevenness exists amongst the white *Cistuses*. *C. populifolius* opens first, then comes *C. ladaniferus*, *C. laurifolius*, and *C. salvifolius*, and last of all *C. hirsutus* and *C. monspeliensis*.

The main time of flowering is not the same in all the species. *C. albidus* flowers about two months earlier than *C. crispus*, while *C. populifolius* has nearly finished by the time *C. hirsutus* and *C. laurifolius* produce their first flowers. In spite of this inequality I have always had at my disposal a sufficient quantity of flowers for the crosses which I have attempted between the species of which the flowering period occupies the two extremities of the series, and I have not found it necessary to use stored pollen.

At the moment when the corolla opens the anthers are still completely closed, and they remain in this state for a period which varies according to the state of humidity of the air, but which is always very short. When dew is abundant the exit of the pollen is a little bit retarded. When the air is very dry the anthers open at the same time as the flower. The pollen expelled gradually from the chambers of the anthers accumulates in little granular masses at the top of the stamens. Later on it detaches itself and falls into the corolla without arriving at the stigmata, if the flowers are covered in such a way as to prevent the visits of insects.

Insects are the agents of natural fertilization of *Cistuses*. Not only do they deposit the pollen on the stigmata, but they transport pollen from one flower to another, an operation without which fertilization would not take place with the majority of the species. The *Cistuses*, although anatomically hermaphrodite, are generally physiologically dioecious. The ovules do not develop under the action of the pollen taken from the same flower or from another flower of the same plant. The co-operation of a second individual is indispensable. This can be demonstrated easily in the case of most of the species by protecting the flowers from the visits of insects and fertilizing them artificially. Under these conditions no seed is produced. On the other hand, some species, such as *C. laurifolius*, *C. sericeus*, and *C. vaginatus*, are entirely hermaphrodite. I have demonstrated this by experiment. For the last two species the proof resulted from the fact that plants of which there was only one specimen cultivated in Mr. THURER'S garden produced each year a quantity of fruits containing fertile seed without hybrid characters. This difference of physiological aptitude does not seem to be associated with any broad anatomical disposition. It is certain that the pollen and the ovules of *Cistuses* which remain sterile under the influence of their own pollen are in very good condition because they are able to fertilize or be fertilized if two distinct individuals are associated. I have tried to determine the precise moment when the normal functioning of the organs ceases, and I have been able to satisfy myself, at least in pure species, that the reason why fertilization does not take place is that the pollen tubes cease to develop after they arrive at the ovules. This is what happens with normal fertilization. The pollen applied to the stigmatic does not delay in germinating. The tubes make their way between the stigmatic papillae until they meet one of the folds which end in the channel, by which the style is indented. They then change direction and enter the channel, which they fill entirely. The channel ends in an elongated cavity, a sort of entrance hall round which open the five or six chambers of the ovary by an equal number of narrow slits situated at the level at the point of insertion of the ovules. The pollen tubes, growing always at their ends, arrive in this entrance hall, spread out in various directions, and penetrate into the chamber through the inter-placentary slits. They then wind along the ovules until they finish by reaching the micropyle. It takes from 50 to 60 hours for the pollen deposited on the stigmata to reach the entrance to the ovules and effect fertilization. Twenty-four hours later the ovary has already doubled

in size. If a plant is fertilized with its own pollen the process is at first the same as with normal fertilization. The pollen tubes enter into the conducting channels and arrive at the end of 24 hours at the base of the stigmata. Some of them make their way into the entrance hall, but there their activity is arrested. I have never seen them enter the chambers of the ovary.

It is just the same when strange pollen is applied which does not cause fertilization. Often fertilization is possible when the pollen tubes arrive in greater or less numbers as far as the ovules, but rather more with normal fertilization. It is hardly necessary to say that in the experiments which have furnished the results mentioned the flowers fertilized were all of the same plant and the operation was effected on the same day and under the same conditions with pollen of the plant itself, the pollen of another plant of the same species, and with foreign pollen. They were in addition protected from any insect intervention. The species which I examined were *C. albidus*, *C. ladaniiferus*, *C. hirsutus*, *C. populifolius*, and *C. salvifolius*. Plants obtained from cuttings did not acquire the faculty of fertilizing plants from which the cuttings were taken.

* * * * *

I have observed so often the functional dioicity of *Cistus*, and the experiments which I have made with the express intention of confirming it have given such definite results, that it is certainly the rule in the immense majority of cases. Nevertheless, I do not consider it an absolute rule, and therefore the practice of removing the stamens in hybridizing experiments on *Cistus* cannot be dispensed with.

Cistus with white flowers possess a very curious character which alone would result in making easier useful crosses and in preventing the pollen of the plant itself from arriving on the stigmata. I mean the movement which the stamens make when touched by a strange body or as the consequence of a sharp jolt, which has the effect of making them rest on the corolla and removing them as far as possible from the stigma. At the moment of opening of the corolla the stamens are erect and form a sort of tube or well in which the pistil is placed. When an insect arrives it settles on the corolla, inserts its proboscis at the base of the filaments, where there exists a viscous secretion in some quantity. Immediately the filaments which have been touched spread, the movement develops consecutively, and within an instant the stamens become extended horizontally. The stigma is then to a great extent exposed. I have not found any trace of sensitiveness in the stamens of the pink *Cistus*. But in their case the stigma habitually extends slightly above the close brush which is formed by the stamens.

Bees are the insects which visit *Cistus* with the greatest activity. As soon as the corolla is open these insects enter, looking with avidity for the nectar-bearing secretion. In their movements they pass and re-pass on the stigma and leave at the surface a portion of the pollen with which they are always abundantly powdered. Other insects again act as means of transport of the pollen. One of those which is most frequently encountered in *Cistus* flowers is *Catonia stictica*, but the damage which this insect does to the flowers by its voracity is such that it is very doubtful whether the benefits derived from its visits to the plants compensate for the damage which is caused.

Whether fertilization takes place or not the flowers soon close and the petals fall. The sepals close in and roll tightly round the pistils and the stamens. In this condition nearly all the *Cistus* are protected from further intervention by insects, as the stigma is entirely covered by the calyx. This is not, however, so with *C. vaginatus*, where the style projects out beyond the sepals, and also in certain hybrids where the style is proportionately longer and the stigma remains exposed after the flower is closed.

A very few days after the pollen has been applied on the stigma one becomes aware of the result of the fertilization. If it has not succeeded the peduncle of the flower soon flags, then it becomes separated and falls after seven or eight days. If fertilization has taken place the ovary enlarges rapidly, pushing up the sepals and spreading them out, leaving visible the top of the capsule which is crowned by a conical head formed by the dried stamens. The fruits mature two or three months after flowering. Of all the species I examined, *C. populifolius* ripens its fruit most rapidly.

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WALL PLANTS.

By Sir FREDERICK W. MOORE, V.M.H.

[Read May 7, 1929; Mr. F. J. HANBURY, V.M.H., in the Chair.]

THE number of questions asked by those with some knowledge of gardening, and by those with no knowledge of gardening, about suitable plants for covering walls, and the difficulty of finding a good list with a few explanatory remarks and cultural directions, suggested to the writer the desirability of taking a few notes in various gardens, and perhaps making an attempt at framing such a list. Another factor which influenced was the number of gardens in which very unsuitable plants had been planted against walls, and the monotonous and uninteresting nature of the plantings—Ivies, Virginian Creeper, *Aristolochia Siphio*, *Escallonia macrantha*, *Forsythia suspensa*, *Pyracantha coccinea*, *Jasminum officinale*, a few strong Roses, and perhaps a *Ceanothus*, planted against a wall 6 or 8 feet high gave promise of much trouble and poor results in the near future.

In making this list, certain conditions have to be considered :

Those who may make use of the list.

The exact purpose for which the plants are required.

Soil and climate of the district in which they are required.

Which plants should be included, and which plants should be omitted.

Proper cultivation is an essential for success in any branch of gardening, and much disappointment and loss is caused by neglecting to give young, or tender, plants a good start. The soil at the base of a wall is generally the poorest in the garden, consisting frequently of the subsoil thrown up when the foundations of the wall were made, mixed with chips of stone or brick, and lime rubbish, thoroughly hungry, and fresh soil or manure is rarely worked in close to the wall, unless when special preparations are made. Therefore ample good suitable material should be provided for each plant placed against a wall. It is essential that the plants, no matter how small, should be properly secured to the wall, taking care that no part of the plant is fastened in direct contact with wire, or with nails. A mulching of light material should always be given, and frequent waterings are necessary. Even in winter, or in wet weather, it will be found that the soil near the wall is very dry. Pruning is another item which rarely receives thoughtful attention. There are probably more failures from neglect of pruning, or from ignorant pruning, than from any other cause.

If evergreen plants, such as Ivies, *Pyracantha*, *Azara microphylla*, and *Clematis calycina*, are pruned in the late autumn, or winter, they

remain unsightly for a long time ; if pruned at the end of March they quickly break into young growth. A sound principle to act on is to note on what wood, and at which season, the flowers are borne, and to prune accordingly. Plants which flower on last season's wood, or on spurs, should be pruned immediately the flowers get shabby ; don't wait until they are all off. Such plants as Forsythias, *Jasminum nudiflorum*, *Clematis montana*, *Clianthus*, *Ceanothus Veitchii*, and *Cydonia japonica* should be so treated. Plants which flower on the current season's growth can be pruned at any time from leaf fall to the end of February.

The extent of such pruning varies with the plants, and can only be arrived at by notes on results. In the case of Vines, *Aristolochia*, and plants of that rampant nature, very hard pruning back is desirable. It must always be remembered that the closer plants are kept to a wall the more benefit they get from it, and the risk of wind damage is diminished.

Now as to those to whom the list of plants may be of use. There are many people who have not experience and who wish to make good use of a wall ; there are people who merely want to cover a wall quickly with any class of climber ; there are others who have failed to get plants to thrive in a position facing north or east ; there are those who know plants and having walls desire to plant only attractive and interesting things on it ; and there are those who live in or near towns who want to know of anything which will grow. All these have to be considered !

Again the influence of soil and climate has to be considered. It would be absurd to think of growing *Clianthus puniceus*, *Dendromecon rigidum*, *Penistemon cordifolius*, *Rubus lineatus*, and *Berberidopsis coralina* in Northampton or Newcastle-on-Tyne, yet all these will thrive in many places where 10° to 15° F. of frost occurs once, or oftener, each year. Similarly one could not recommend planting Camellias, *Berberidopsis*, *Tricuspidaria* in soil full of lime. Those who are fortunate enough to possess gardens in a good district, and in a lime-free soil, will wonder why such plants as *Styrax*, *Ribes speciosum*, *Teucrium fruticans*, *Tricuspidaria*, *Magnolia Wilsonii*, *Phygelius*, *Bursaria*, *Corylopsis*, *Choisya*, etc., are included, but if they will try *Ribes speciosum*, *Magnolia Wilsonii*, *Veronica Hulkeana*, *Indigofera rubro-violacea*, *Fuchsia macrostemma*, and *Styrax Wilsonii*, against a wall they will find that they are most effective, and more free-flowering than when grown in the open ground. Those whose gardens are less favourably situated will find it absolutely necessary to grow these, and other comparatively tender plants, against a wall to get any pleasure or satisfaction from them.

All the plants given in this list have been seen by me grown against walls, and all have seemed to me to have been suitable for the purpose for which they were used. On the other hand, several have been purposely omitted as they did not seem of sufficient merit to occupy space on a wall where better plants could be grown. I have not mentioned

varieties of garden Roses, or of Clematis. These are specialists' plants and must be left to individual taste. Plants which die to the ground in winter and make rampant growth in summer are also omitted. The following will be missed from the list, although often recommended as suitable :

Acacias, such as *lophantha*, *decurrens*, *melanoxydon* (too vigorous) ;
Buddleia variabilis (too vigorous and brittle) ;

Celastrus sps. (all too coarse) ;

Cistus (the stronger species do not stand cutting hard back, and are brittle) ;

Clematis montana, *C. Viticella*, *C. Flammula*, *C. Vitalba* (too strong for a wall ; more suitable for training up trees or over arches) ;
 Cocculus ; Elscholtzia ; Eriobotrya ; Golden Hop ; Menispermum ;
 Muehlenbeckias ;

Paliurus (coarse and unattractive) ;

Pueraria ;

Pyracantha crenulata (not so good as other species) ;

Roses, garden varieties, left to personal selection ;

Rubus australis (rather coarse-growing).

In all gardening matters it is impossible to lay down hard-and-fast rules, and many successes are due to intelligent observation, and to experimental work, often in direct variance with the precepts and principles of gardening as generally understood. It is therefore always risky to give a list of plants as suitable for a definite locality, especially if one be unacquainted with the locality. The best possible guide is to note plants which appear to do well in neighbouring gardens ; make a beginning with the best of them, and then start to experiment with the plants you wish to grow. Many surprises will follow !

One fundamental rule is to avoid planting rampant growers such as *Aristolochia Siphon*, *Clematis montana*, *C. Flammula*, *C. Vitalba*, *Holboellia latifolia*, *Lardizabala biternata*, *Polygonum Aubertii*, *P. baldschuanicum*, and *Vitis Thunbergii* where space is limited, unless you are prepared to give up the whole space to them. They quickly smother less robust neighbours. These plants are suitable for covering high walls, or buildings, and especially for rambling over trees and strong shrubs. Want of success is frequently due to not understanding some peculiar habit, or idiosyncrasy, of the plant we are trying to grow. *Dendromecon rigidum* has defied many ; with others it is kind and willing. I had great difficulty in getting it to grow until a gardener from California saw it and said " You are growing it too flat, it grows wild on sloping banks in shale, and hates dampness ; don't water it." Fortunately I was able to give it such a position, raised and dry, and now find it free, vigorous, floriferous, and *perfectly* hardy, having withstood 20° F. frost. It is never out of flower.

Mutisia decurrens is a source of trouble to many. It is worth taking trouble with, as it is quite dazzling when 30-40 flowers are

seen open in the sun. This plant seems to like being placed under the protection of some not very strong-growing wall plant, in loose open material, with plenty of space to spread underground without competition from other plants, dry and warm, and when once established it should not be disturbed, nor should the underground runners be interfered with in any way. Do not be tempted to take bits off for friends!

Another plant which seems to like the close company of other plants is *Berberidopsis corallina*. When once established it is very accommodating and prefers shade and moisture. In Ireland it is perfectly hardy in lime-free soils. It was uninjured by the severe frost of March 12, 1928, when such plants as *Pentstemon cordifolius*, *Sophora tetraptera*, *Raphiolepis japonica*, *Clematis indivisa*, and *Acacia decurrens* were killed outright. In Co. Wicklow there was a fine plant which had clambered up a large loose-growing dark red *Pyrus japonica* against a wall, and as they sometimes flowered together the effect was charming. The finest specimen in Ireland is at Rostrevor House where, planted in a moist and very shady position, it has climbed an old Hawthorn, spread over many yards of surface: a wonderful sight when in flower. In another garden it practically covered an old *Pyracantha coccinea* on a wall facing due north.

In the Wicklow garden above mentioned there was another very effective wall group. In a small yard facing north-east a white Camellia and a good red *Pyrus japonica* had been planted many years ago against the steward's office. These got little attention, and had formed large loose plants which intermingled, flowered together and made a most effective combination.

There are certain plants given in the list which offer difficulties to many growers and about which it seems impossible to give helpful advice. *Cassia corymbosa* is one of them. It is found growing well in unexpected places, and flowering freely. In other places where conditions are apparently more favourable it refuses to live more than a couple of years. It is of course only suitable for the mildest districts, but where it will grow it is worth a good position. It likes sun, and apparently its greatest enemy is a strong drying wind.

Clematis indivisa and its varieties are generally described as being quite hardy, and easy to grow. But are they? Good gardeners from New Zealand say "Plant it against a strong evergreen bush, it will soon smother it." I have tried it many times and lost it each time. In Ireland it only succeeds against a good sunny wall, but is well worth the best place that can be given it. There is no other plant which gives such a mass of good white flowers as it does, and it lasts long in flower. It has an inclination to get bare at the base after a few years, and does not break freely from old stems. Pruning must therefore be attended to from the earliest stages. Other species of *Clematis* which are more easily managed, and which never fail to please, giving us our first flowers in spring and our last in the autumn, are *C. balearica*, *C. cirrhosa*, *C. tangutica*, *C. viticella rubra* and *C. viticella albo-luxurians*.

The last named came many years ago from the Coombe Wood Nursery and is the last to flower. The flowers are large for a *Viticella* hybrid, white with green splashes, and attractive. The fruits of the early-flowering species, and of some summer flowerers, such as *tangutica* and *orientalis*, are an immense addition to their attractions, and last until leaf fall, glistening silver balls of fluff.

It would occupy too much space to write in detail about all the plants mentioned, nor is it necessary to do so. A few more may have special attention drawn to them. A notable addition to our garden plants are the 'Citranges,' the name given to them by the American raisers. Plants of three, named 'Colman,' 'Morton,' and 'Savage,' were sent to me with a request that I would have their hardiness in Ireland tested. They are supposed to be the foundation of an attempt to get edible hardy varieties of Orange and Lemon for more extended cultivation than is possible with existing varieties, and were raised by crossing *Aegle sepiaria* with Lemons and Oranges. They have proved to be hardy in every district in Ireland to which I sent them. In the sunny, mild climate of Bray, and in the moist climate of Kilmacurragh in Co. Wicklow, they have lived as shrubs in the open without any protection, and quite uninjured by frost. In the harsher climate of Glasnevin they are first-rate wall plants, evergreen, beautiful when covered with sweet-scented white flowers, and quite hardy, but so far they have only been tested there on a good sunny wall.

Lapageria rosea, and its variety *alba*, are hardy in several districts in Ireland, not only against a wall but trained up small trees. It is, however, only suitable for really mild districts, and must have certain conditions: shade, shelter, moisture. As with plants just mentioned, it is happiest when rambling through some other plant of not too strong or dense growth, from which it gets shelter and support. In Mr. WALPOLE's charming garden at Mount Usher, Co. Wicklow, it has been trained up Alder trees near the river, and may be seen hanging from the branches, sprays 7-8 feet long, carrying as many as eleven fully open flowers.

It seems strange to see *Rhododendrons* given as plants suitable for planting against walls. Several of them do far better against a wall than when planted in the open. *R. spinuliferum* gives a fine splash of colour when spread out on a wall, and puzzles many visitors as to what it is. In many districts *R. Maddenii*, *R. Lindleyi*, *R. fragrantissimum*, *R. 'Lady Alice Fitzwilliam'*, etc., although they live through the winters, get their buds injured and they fail to open; trained to a wall in a loose manner many buds remain uninjured and open freely. In Co. Meath, a comparatively cold part of Ireland, I saw on April 14 these with buds untouched, some already opening, and foliage quite uninjured after two hard winters, reaching nearly to the top of a 10-foot wall.

The *Itæas* are well worth their place on any wall, and are often much more attractive than when planted in the open. They will do well on a wall facing east provided they are sheltered from direct wind.

Intending planters will find *Ribes laurifolium* and *R. viburnifolium* well worth places. The first named is one of the very early flowerers, being good in March and apparently quite uninjured by the frosts of that month. The flowers are pale lemon-yellow, carried on pendulous racemes 3-4 inches long. The male and female flowers are borne on different plants.

The large-leaved Mahonias, or Berberis, are very useful for covering ugly spots on walls, dark corners, etc., and are very striking and handsome, the foliage remaining untouched by frost and unbrowned by wind, leaves over 2 feet long with *M. nepalensis*, and abundant flowers. The small grey-leaved species from the dry Southern States of America are in striking contrast to these. They are slow growers, invaluable for the distinct and effective contrast made by their blue-green glistening foliage with the green of their neighbours. *Mahonia Fremontii* is the best of them and should find a place wherever a bright sunny dry aspect can be found for it.

It will probably be assumed that a mistake has been made in putting the name of *Phygelius capensis* in the list. This is not the case. On the south-east side of Howth Head, fully exposed to the winds which come sweeping across the Bay from the mountains, and about 35 yards from the sea, stands a gable-fronted house some 30 feet high, which is covered from bottom to top with *Phygelius*. It is one of the most remarkable sights in the way of wall plants which can be seen.

Finally I would recommend everyone to have a plant of *Chimonanthus fragrans*, *Lonicera Standishii* and *L. fragrantissimum* on their walls. The first requires sun, the other two will succeed in any aspect. These three will provide flowers with the sweetest perfume during the dreariest period of the year, December and January, small sprays of which will scent a room, and are ever a welcome gift to those without a garden.

No one can be more aware of the imperfections of these lists, and remarks, than the writer. The omissions and inclusions will be severely criticized. They can be partly explained by the fact that no plant has been included which has not been seen by the writer cultivated as a wall plant, and the notes have chiefly been made in Irish gardens. The present effort is an attempt to supply a want, and will, I trust, form a foundation on which, after necessary erasures, a more complete list can be constructed by someone better acquainted with English gardens.

Plants suitable for covering low partition walls 4-6 feet high.

<i>Artemisia arborescens.</i>	<i>Cotoneaster horizontalis.</i>
<i>Berberis Fremontii.</i>	<i>Cydonia Maulei.</i>
<i>Carpenteria californica.</i>	„ „ <i>atrosanguinea.</i>
<i>Ceanothus papillosus.</i>	„ „ <i>Sargentii.</i>
„ ‘Gloire de Versailles.’	<i>Escallonia rubra.</i>
<i>Ceratostigma Griffithii.</i>	<i>Euonymus radicans</i> ‘Silver Gem.’
<i>Choisya ternata.</i>	<i>Fuchsia macrostemma.</i>
<i>Corylopsis Willmottiae.</i>	Small-leaved Ivies.

<i>Helichrysum rosmarinifolium.</i>	<i>Phygeliuss capensis coccineus.</i>
<i>Lippia citriodora.</i>	<i>Prunus triloba fl. pl.</i>
<i>Myrtus communis.</i>	<i>Ribes speciosum.</i>
" " <i>fl. pl.</i>	<i>Styrax Wilsonii.</i>
<i>Olearia macrocephala.</i>	<i>Teucrium fruticans.</i>
<i>Phygeliuss capensis.</i>	

Plants suitable for planting against high walls or buildings.

S. = likes sun. T. = tender. N.E. = will do well facing north or east. C. = for planting in or near cities.

<i>Actinidia arguta.</i>	<i>Clematis paniculata.</i>
" <i>chinensis.</i>	" <i>tangutica.</i>
" <i>Kolomikta.</i>	" <i>Viticella, N.E.</i>
" <i>polygama.</i>	" " <i>albo-luxurians, C.</i>
" <i>purpurea.</i>	" " <i>rubra.</i>
<i>Akebia lobata.</i>	<i>Clianthus puniceus, S., T.</i>
<i>Ampelopsis, see Vitis.</i>	" " <i>alba, S., T.</i>
<i>Aristolochia altissima.</i>	<i>Dendromecon rigidum, S., T.</i>
" <i>Sipho, C.</i>	<i>Elaeagnus pungens aureo-variegata, N.E.</i>
" <i>tomentosa.</i>	<i>Ercilla volubilis, C.</i>
<i>Azara microphylla.</i>	<i>Escallonia exoniensis.</i>
<i>Bignonia capreolata, T.</i>	" <i>macrantha, N.E., C.</i>
<i>Buddleia auriculata.</i>	" <i>montevidentis, S.</i>
" <i>Colvillei, T.</i>	" <i>organensis, S., T.</i>
<i>Bursaria spinosa.</i>	" <i>Philippiana, S.</i>
<i>Camellia japonica (vigorous varieties), N.E.</i>	" <i>pterocladon, S., T.</i>
" <i>reticulata, T., N.E.</i>	<i>Exochorda Giralddii.</i>
<i>Cassia corymbosa, T., S.</i>	" " <i>Wilsonii.</i>
" <i>laevigata, T., S.</i>	" <i>Korolkowii.</i>
<i>Ceanothus floribundus, S.</i>	" <i>macrantha.</i>
" <i>thyrsiflorus, S., N.E.</i>	<i>Forsythia atrocaulis, N.E.</i>
" <i>Veitchianus, S., C.</i>	" <i>suspensa, C.</i>
<i>Clematis Armandii, N.E.</i>	<i>Garrya elliptica, N.E.</i>
" <i>aromatica.</i>	<i>Hedera canariensis (H. maderensis), N.E.</i>
" <i>balearica (calycina), S.</i>	" " <i>var. azorica, N.E.</i>
" <i>cirrhusa, S.</i>	" <i>colchica (H. Roegneriana), N.E.</i>
" <i>Flammula.</i>	" " <i>var. dentata.</i>
" <i>indivisa, T., S.</i>	" <i>Helix var. lobata major, N.E., C.</i>
" <i>lobata, T., S.</i>	" " " <i>marginata major, C.</i>
" <i>parviflora, T., S.</i>	" " " <i>palmata aurea, C.</i>
" <i>montana.</i>	" " " <i>purpurea, N.E.</i>
" " <i>rubens, C.</i>	
" " <i>Wilsonii, C.</i>	
" " " <i>platy-petala.</i>	
" <i>orientalis.</i>	

<i>Hedera hibernica</i> , N.E.	<i>Rosa Banksiae</i> , S., T.
„ „ <i>foliis argentea</i> .	„ <i>bracteata</i> , S., T.
<i>Holboellia latifolia</i> (<i>Stauntonia</i>).	„ <i>laevigata</i> .
<i>Hydrangea petiolaris</i> .	„ „ var. 'Anemone,'
<i>Jasminum nudiflorum</i> , N.E., C.	T.
„ <i>officinale</i> , C.	„ <i>moschata</i> .
„ „ <i>grandiflorum</i> .	<i>Schizandra chinensis</i> , N.E.
„ <i>revolutum</i> , N.E.	<i>Schizophragma hydrangeoides</i> .
<i>Lardizabala biternata</i> , T.	„ <i>integrifolium</i> .
<i>Lonicera Caprifolium</i> , N.E.	<i>Solanum crispum</i> .
„ <i>Etrusca</i> .	„ <i>jasminoides</i> , T., C.
„ <i>italica</i> .	<i>Smilax aspera</i> .
„ <i>japonica</i> .	„ <i>china</i> .
„ <i>Periclymenum</i> , N.E.	<i>Sophora tetraptera grandiflora</i> , T.
„ <i>sempervirens</i> , T.	<i>Tecoma grandiflora</i> , T., S.
„ <i>tragophylla</i> , T.	„ <i>radicans</i> , T., S.
<i>Magnolia Campbellii</i> , T.	<i>Tricuspidaria lanceolata</i> , N.E.
„ <i>Delavayi</i> .	<i>Umbellularia californica</i> .
„ <i>grandiflora</i> , C.	<i>Vitis armata</i> (<i>Davidii</i>), C.
<i>Mandevilla suaveolens</i> , S.	„ <i>flexuosa</i> , N.E.
<i>Muehlenbeckia complexa</i> .	„ <i>Henryi</i> , T.
<i>Passiflora coerulea</i> , T.	„ <i>heterophylla</i> , S.
„ 'Constance Elliott,' T.	„ <i>inconstans</i> (<i>Ampelopsis</i>), C.
<i>Photinia Davidsoniae</i> .	„ <i>megalophylla</i> .
„ <i>serrulata</i> .	„ <i>quinquefolia</i> (<i>Ampelopsis</i>),
<i>Polygonum Aubertii</i> .	C., N.E.
„ <i>baldschuanicum</i> , C.	„ <i>striata</i> (<i>Ampelopsis</i>), T.
<i>Pyracantha angustifolia</i> , N.E.	„ <i>Thunbergii</i> .
„ <i>coccinea</i> , N.E., C.	„ <i>vinifera purpurea</i> , N., C.
„ „ <i>Lalandei</i> .	<i>Wistaria chinensis</i> , S., C.
„ <i>Gibbsii</i> .	„ „ <i>alba</i> .
„ <i>Rogersiana</i> , N.E.	„ <i>multijuga</i> , S., C.
„ <i>yunnanensis</i> .	„ „ <i>alba</i> , S.
<i>Rosa anemonaeflora</i> , S.	„ „ <i>rosea</i> , S.

Plants suitable for planting against walls up to 10 feet.

T. = tender. S. = likes sun. N.E. = best on wall facing north or east. C. = suitable for planting in or near cities.

<i>Abelia chinensis</i> .	<i>Aristolochia heterophylla</i> .
„ <i>floribunda</i> , T.	„ <i>moupinensis</i> .
<i>Abutilon megapotamicum</i> , T.	<i>Artemisia arborescens</i> , C., T.
<i>Adenocarpus decorticans</i> , S.	<i>Azara Gilliesii</i> .
<i>Aegle sepiaria</i> .	„ <i>integrifolia</i> .
<i>Akebia quinata</i> .	„ „ <i>variegata</i> .
<i>Aloysia</i> (<i>Lippia</i>) <i>citriodora</i> , S., T.,	<i>Bauhinia yunnanensis</i> , S.
C.	<i>Berberidopsis corallina</i> , N.E.
<i>Anthyllis Barba-jovis</i> .	<i>Billardiera longiflora</i> , S., T.

- Buddleia Colvillei*.
 „ *paniculata*.
Bursaria spinosa, S.
Callistemon coccineus, S.
 „ *lanceolatus*.
 „ *salignus*.
Camellia cuspidata, N.E.
 „ *japonica albo-magnifica*,
 N.E.
 „ *reticulata*, N.E.
 „ *Sasanqua*, N.E.
Cantua buxifolia, S., T.
Carpenteria californica, S.
Caryopteris Mastacanthus, S.
Cassia corymbosa, S., T.
Cassinia leptophylla, T.
 „ *Vauvilliersii*.
Ceanothus dentatus floribundus.
 „ *papillosus*, C.
 „ *rigidus*.
 „ *Veitchianus*.
 „ 'Gloire de Versailles,'
 C.
Ceratostigma Griffithii, S.
 „ *Polhilli*, S.
 „ *Willmottianum*, S.
Cestrum elegans.
 „ *fasciculatum*.
Chimonanthus fragrans, S., C.
Choisya ternata, N.E., C.
Citrange 'Colman.'
 „ 'Morton.'
 „ 'Savage.'
Clematis alpina
 „ *aromatica*.
 „ *calycina*.
 „ *chrysocoma*.
 „ *concinna*.
 „ *indivisa*.
 „ „ *lobata*.
 „ *montana Wilsonii*, C.
 „ *Prattii*.
 „ *tangutica*, C.
 „ *Viticella rubra*, C.
Colquhounia vestita, S., T.
Corokea macrocarpa.
Coronilla glauca, S.
Correa speciosa Harrissii, S., T.
- Corylopsis Griffithii*, S.
 „ *Willmottiae*, S., C.
Cotoneaster horizontalis, C.
 „ „ *variegatus*.
 „ *microphylla*, C.
Cydonia japonica, C., N.E.
 „ „ *alba grandiflora*,
 C.
 „ „ *cardinalis*, N.E.,
 C.
 „ „ *nivalis*.
 „ „ *princeps*, N.E.,
 C.
 „ „ *versicolor*.
 „ *Maulei*, N.E., C.
 „ „ *alba*.
 „ „ *atrosanguinea*,
 N.E., C.
 „ „ *Sargentii*, N.E.,
 C.
Cytisus fragrans, S., T.
 „ „ *elegans*, S., T.
 „ *Hildebrandtii*, S., T.
 „ *monspessulanus*, N.E.
Decumaria barbara, S., T.
Dendromecon rigidum, S.
Desmodium tiliaefolium, S.
Eccremocarpus scaber, S.
Escallonia langleyensis, N.E., C.
 „ *montana*, N.E., C.
 „ *organensis*.
 „ *rubra*, N.E., C.
Euonymus fimbriatus, T.
 „ *radicans*, N.E.
 „ „ 'Silver Gem,'
 N.E., C.
Exochorda Albertii macrantha.
 „ *racemosa*.
Fabiana imbricata, S.
Feijoa Sellowiana, T., S.
Fendlera rupicola, S.
Forsythia atrocaulis, C.
 „ *suspensa*, C.
Fremontia californica.
 „ *mexicana*.
Fuchsia corallina, S.
 „ *macrostemma*, S., C.
Hedera argentea elegans, C.

- Hedera aurea densa*, C.
 „ *Caenwoodiana*, C.
 „ „ *aurea*, C.
 „ *marginata aurea*, C.
 „ ‘Mrs. Pollock,’ C.
 „ ‘Silver Queen,’ C.
 „ *tricolor gracilis*, C.
Helichrysum rosmarinifolium, C.
Hibiscus syriacus (best varieties), C.
Hypericum chinense.
 „ *Hookerianum*.
 „ *Leschenaultii*.
Indigofera Dosua var. *tomentosa*.
 „ *macroptera*.
 „ *rubra violacea*.
Itea ilicifolia, N.E.
 „ *virginica*, N.E.
Jasminum nudiflorum var. *Sieboldianum*, N.E., C.
 „ *primulinum*, T.
Kadsura japonica, T., S.
Lapageria rosea, T., shade.
Leptospermums, T., N.E.
Lippia citriodora, T., S., C.
Lonicera ciliosa.
 „ *fragrantissima*.
 „ *Giraldii*.
 „ *Heckrothii*.
 „ *Hendersonii*.
 „ *japonica*.
 „ „ *aureo reticulata*, C.
 „ „ *Halliana*, C.
 „ *sempervirens*.
 „ „ *minor*.
 „ *Standishii*.
 „ *tragophylla*, N.E.
Magnolia Watsonii, N.E.
 „ *Wilsonii*, N.E.
Mahonia Fremontii, S.
 „ *haematocarpa*, S.
 „ *japonica*, S.
 „ *nepalensis*, N.E.
 „ *trifoliolata*, S.
Mandevilla suaveolens, T., S.
Medicago arborea, S.
Metrosideros lucida, T.
- Mitraria coccinea*, N.E.
Mutisia Clematis, T., S.
 „ *decurrans*, S.
Myrtus communis.
 „ „ *fol. var.*
 „ „ *fl. pl.*
 „ *Bidwillii*.
Neviusia alabamensis, S.
Olearia macrocephala, C.
Osteomeles anthyllidifolia.
Pentstemon cordifolius, S.
Philadelphus mexicanus, N.E., C.
 „ *Coulteri*.
Phygelius capensis, S., C.
 „ *coccineus*, S.
Pieris formosa, N.E.
Pilostegia viburnoides.
Prostanthera lasianthos, T.
Prunus triloba fl. pl., S., C.
Psoralea pinnata, T.
Punica Granatum, S.
 „ „ *fl. pl.*, S.
Pyracantha angustifolia.
 „ *Rogersiana*.
 „ *yunnanensis*.
Raphithamnus cyanocarpus, T.
Rhododendron Edgeworthii, T., N.E.
 „ *Forsterianum*, T., N.E.
 „ *fragrantissimum*, T., N.E.
 „ *Sesterianum*, T., N.E.
 „ *spinuliferum*, T.
Ribes laurifolium, male.
 „ „ female.
 „ *speciosum*, N.E., C.
 „ *viburnifolium*.
 Roses (garden).
Rosa Banksiae, S.
 „ *bracteata*, S.
 „ *Ecae*, S.
 „ *laevigata* and *laevigata var.*
 „ *Anemone*, S.
Rubus bambusarum, N.E.
 „ *lineatus*, N.E., T.
Schizandra chinensis.

<i>Schizandra grandiflora</i> .	<i>Trachelospermum jasminoides</i> fol.
„ <i>rubriflora</i> .	var.
„ <i>sphenanthera</i> .	<i>Tricuspidaria lanceolata</i> , N.E.
<i>Schizophragma hydrangeoides</i> .	<i>Tropaeolum speciosum</i> , N.E.
<i>Senecio rotundifolius</i> , N.E.	<i>Veronica Hulkeana</i> , C., T.
<i>Solanum crispum</i> .	<i>Viburnum macrocephalum</i> .
„ <i>jasminoides</i> , N.E.	<i>Vitis flexuosa typica</i> , C.
<i>Sollya Drummondii</i> , T.	„ <i>heterophylla humulifolia</i> , S.
„ <i>heterophylla</i> , T.	„ <i>himalayana rubrifolia</i> , S., C.
<i>Sophora tetraptera</i> McNabbiana,	„ <i>inconstans</i> (<i>Ampelopsis Veit-</i>
S.	chii), N.E., C.
„ <i>viciifolia</i> , S.	„ „ <i>Lowii</i> .
<i>Styrax Wilsonii</i> , S., C.	„ <i>pulchra</i> (<i>V. flexuosa major</i>),
<i>Tecoma grandiflora sanguinea</i> , S.,	N.E., C.
C.	„ <i>Thompsonii</i> .
„ <i>radicans</i> , S., C.	„ <i>vinifera purpurea</i> , N.E., C.
<i>Teucrium fruticans</i> , C.	<i>Wistaria frutescens</i> .
<i>Trachelospermum jasminoides</i> .	„ „ <i>macrostachya</i> .

REFRIGERATION OF FLOWERS, FRUIT AND VEGETABLES.

By F. E. GARNETT.

REFRIGERATION to-day plays a very important part in industry, and year by year it spreads its tentacles farther and farther afield.

More than a hundred distinct applications could be mentioned in which it figures to a greater or less extent. In the industry which is of greater importance than any other to the human race—that is to say, our food supplies—it reigns supreme, and so far as this country is concerned it has become an essential factor of our existence.

Some indication of the important part which refrigeration plays in our food industries is given by the expenditure during the last few years on the part of the Government through the Empire Marketing Board on Research Stations. One of the most notable is the Cambridge Low Temperature Station for research in biochemistry and biophysics, originally built in 1921 and recently extended. This institution is unique in the elaboration and refinement of its equipment, enabling experiments to be undertaken with temperature control within limits never before attempted. The results of the invaluable work carried out which has chiefly concerned the storage of fruit are well known to all those concerned, through the publication of reports issued by the Food Investigation Board. The East Malling Research Station, now under construction, is a still larger scheme and will provide facilities for research on a larger scale and on more commercial lines, and the provision of this further station demonstrates the still wider fields awaiting investigation which extensive research inevitably opens up.

Amongst other research stations may be mentioned the following: The Long Ashton Station, dealing especially with the cider industry; the station at Pirbright for investigation of foot-and-mouth disease; the Aberdeen Station, dealing with the fishing industry; the National Institute for Research in Dairying at Shinfield. Bearing especially on the fruit industry overseas mention should also be made of the station recently completed for the Imperial College of Tropical Agriculture at Trinidad for research on bananas. Owing to the ravages of the Panama disease, research is being undertaken at this station in conjunction with Kew Gardens with a view to evolving new varieties of fruit immune from the disease and capable of withstanding the journey to this country.

A few words on the rise of this great art of the mechanical production of cold may be of interest here. That a low temperature could

be produced by the combination of two solid bodies uniting to form a liquid has probably been known to scientists for centuries. In 1709 a mixture of crushed ice and salt was employed by FAHRENHEIT when he obtained his zero and placed the freezing-point of water at 32°.

The cold-air machine is based on one of the simplest principles of physics, that is to say, that the compression of air or other gas generates heat, and the subsequent expansion of this air or gas causes cold.

The system which is in almost universal use to-day is that of the evaporation of a volatile liquid having a low boiling-point. The most common refrigerants are ammonia, carbon dioxide, sulphur dioxide, and methyl chloride.

In 1873 Professor Linde introduced the ammonia compression machine which is so well known. In 1888 J. and E. HALL of Dartford, England, introduced the CO₂ compression machine into this country. Britain has, in fact, played a leading part in the world as pioneer in refrigerating engineering, in which such names as HALL, LIGHTFOOT, and HASLAM are famous.

It can be said that the production of mechanical refrigerating machines for commercial purposes commenced in the late seventies, and it is with the practical application of these machines and their development for the benefit of the community that we can now deal.

Great Britain was once called "The cradle of refrigeration" by the German refrigerator inventor, Dr. LINDE. It is true that refrigeration has materially helped to build up the British Empire. Without the aid of refrigeration, the shipment of vast supplies of first-class fresh meat, bred in our Overseas Dominions from the pedigree herds and flocks of our own country, and also the high-grade butters obtainable from New Zealand and Australia, would be impossible.

This industry has been built up on the efficiency of the modern refrigerating machine, which extracts the heat from the goods which it holds in their fresh condition and does this without rendering them harmful, as in the case of the chemicals until lately used in many of our foods. Refrigeration, however, is the silent handmaid of scores of other industries and branches of commerce more or less unknown to the outside world. When I tell you that besides its application to the cold storage of more than two hundred different kinds of commodities, and its uses in ice manufacture, it is employed for such varied uses as the manufacture of chocolate, glue, artificial silk, isinglass, ink, refined oils, photo materials, optical instruments, furs, refined sugar, carbonated beverages, and many other commodities, you will understand its extensive character. No battleship ventures to sea without her ammunition being held under refrigeration, and at home our leading theatres and largest places of assembly are adopting artificial air cooling, as are our factories for the convenience and better work of the employees.

Thanks to refrigeration, the Englishman to-day is served with fresh fruit of various kinds all the year round, instead of at only one brief harvesting season, and the supply of peaches, grapes, plums and pears

from South Africa in February, of apples from Canada or Australia in early summer, is a means of profitable inter-Empire trade, which would be impossible without this great force of mechanical refrigeration.

The home farmer too is beginning to find that refrigeration is his friend instead of being the reverse. So far as home-grown fruit is concerned the fault of this country has been acknowledged to be lack of care in the improvement of orchards, of grading and marketing methods. With respect to marketing, refrigeration permits the grower to devote more time to grading and packing his fruit. One of the largest growers in the country stated recently: "I find cold storage enables me to establish and maintain a standard of quality for my apples and to regulate my supplies according to demand."

At this point I might mention one of the earliest series of experiments to determine the effects of cold storage on various fruits, carried out at Dartford as far back as 1898 under the auspices of the Kent County Council, the results of which were embodied in a report by Mr. W. P. WRIGHT, Superintendent of Horticulture.

These experiments dealt with soft fruits such as strawberries, plums, black and red currants, and cherries, and also with apples and pears. You will find them mentioned in much of the literature which has since been published.

It was about this time that the importation of apples from Australasia began to receive attention from the shipping companies.

A favourable report was submitted indicating great possibilities, and Mr. WRIGHT wrote the following: "If cold storage can be profitably employed against British growers, they would be wise to ask themselves whether it cannot be profitably employed for them."

APPLES.

The total imports of apples into Great Britain and Northern Ireland for the last three years were as follows:

	Tons.	£
1925	299,000	7,540,000
1926	414,000	9,560,000
1927	308,000	7,272,000
	<hr/>	<hr/>
Total	1,021,000	24,372,000
	<hr/>	<hr/>
Average	340,000	8,120,000

BANANAS.

The figures for 1927 were: total quantity shipped to Europe in refrigerated vessels (*i.e.* excluding supplies from the Canaries) was 18 million bunches (298,000 tons). This represents about 2,340 million bananas.

The value of refrigeration as applied to fruit can be considered from two standpoints: firstly, it enables vast supplies of fruit to be brought

to this country which could not otherwise reach us; and secondly, it provides a means of avoiding the waste of a large amount of our own food supplies which inevitably occurs during a period of glut. An industry in which the value of the product, or at least the margin of profit, is lowered during a period of glut to vanishing point cannot afford to pay a living wage to its workers. It is clear that cold storage provides a ready means of solving this problem, and not only yields a handsome profit to the grower who takes advantage of it, but also tends towards stabilization of price at an economic level when slump prices would otherwise prevail.

It is a remarkable fact that it was not until 1913 that the first commercial cold store of the type we are considering was erected in this country. This store was put up by Mr. SPENCER MOUNT, an enterprising grower near Canterbury, who was able to place on the market English apples such as 'Bramley's Seedling' at a time when they were obtainable from no other source.

It has been suggested that it is hardly a commercial proposition for a grower to put down his own plant for cold storage of fruit only, seeing that the capital so expended is only employed for a few months in the year. Experience, however, has proved that this is very far from the case. It is customary to start operations by storing early apples such as 'Worcester Pearmain' for about four to six weeks, by which time the market price has appreciably risen; to follow on with an apple such as 'Cox's Orange Pippin,' holding these until about Christmas time; and finally, to fill up the store with late keeping varieties, such as 'Bramley's Seedling' and 'Newton Wonder.' 'Bismarck' and 'Lord Derby' are also frequently stored, and various varieties of pears.

It must not, however, be supposed that by refrigeration you can preserve indefinitely any living matter such as we are considering; it can only serve to slow down the normal life cycle; nor does it in all cases provide a complete and infallible remedy against change and decay.

I must now pass on to some of the difficulties which have to be contended with. These have chiefly arisen in connexion with the marine transport of fruit.

1922 was somewhat of a disastrous year so far as the Australian apple season was concerned. Of the total import of approximately 2,000,000 cases, it was estimated that between 500,000 and 600,000 arrived in England in a damaged condition. The losses for the season, reckoned as the difference between the value of sound and damaged fruit, reached the enormous total of £250,000. It was largely as the result of these losses that the Low Temperature Research Station undertook an extensive series of experiments, the results of which have been published in the Food Investigation Board Reports Nos. 20, 21, 22 and 23.

Briefly, the conclusion arrived at was that the damage was primarily due to suffocation.

It has long been known that an apple is a living organism consuming oxygen and giving off CO_2 during respiration, the rate of production of CO_2 varying enormously with the temperature of the fruit. At 50°F . the rate of production of CO_2 is twice and at 70°F . four times the rate at 32°F . Air ordinarily contains about 21 per cent. of oxygen and a negligible quantity of CO_2 , and it has been found that during respiration of the fruit the CO_2 content increases precisely at the same rate as the oxygen is consumed, the sum of the two remaining at approximately 21 per cent. It has been found that a moderate concentration of CO_2 is of actual advantage, but that the danger point occurs when the concentration reaches about 10 per cent.

It has been shown that, generally speaking, the lower the temperature the greater the retarding effect on the ripening process. Now the freezing-point of apple juice is about $28\frac{1}{2}^\circ \text{F}$., but it must not be assumed that this constitutes the optimum temperature for storage. Apples in storage are susceptible to a functional disease which has been termed "internal breakdown," and their resistance to this disease decreases as the temperature falls. For practical purposes, therefore, you have to compromise by sacrificing the maximum life of the apple, so as to avoid the risk of failure from this cause; and the latest information available indicates a temperature of 35°F . to 36°F . as the most suitable for general purposes.

The effects of internal breakdown may or may not be visible from the exterior. Certain research workers found that it was more prevalent in the case of apples picked either before maturity or when over-ripe. Other evidence is rather conflicting, but the latest results indicate that with advancing maturity the susceptibility to the disease increases progressively.

A further disease to which apples in cold storage are liable is scald. This takes the form of a browning of the skin, and is often unaccompanied by any deterioration of the flesh.

This disease is said to cause greater loss in the United States than all other diseases.

Certain varieties, such as 'Newton Wonder,' are particularly susceptible. Very satisfactory results have been obtained by wrapping fruit in paper wrappers soaked in inodorous mineral oil. Where apples are packed in barrels good results have also been obtained by distributing straw or other packing material soaked in this oil throughout the barrel.

One other ailment should be mentioned, and that is injury to the fruit through freezing. This, however, need not perhaps be discussed, as it should not occur in the case of a properly managed cold-storage plant.

SOFT FRUITS.

The storage of soft fruits, such as plums, with a view to awaiting more favourable market prices, is a practicable but more delicate operation. Owing to the short season, the price fluctuations over a

brief period are very large and the speculative inducement to the grower correspondingly alluring, but it must be understood that the risks are considerable. The storage period varies greatly with different varieties. Greengages have been kept for as long as ten weeks, 'Pershire Egg Plum' for six weeks, and 'Victoria' or 'Monarch' Plums may quite safely be stored for two weeks. You are all familiar with the Cape Plums which now appear on the market in very satisfactory condition after their journey of nearly three weeks from South Africa.

The degree of maturity is a very important factor, and in several cases with which I have come in contact during the last two years, a tendency has been observed to allow ripening to proceed too far before placing the fruit in storage, and to leave it in storage too long, with the result that, although its condition before withdrawal appears excellent, breakdown occurs after removal from the store too soon to satisfy market conditions. A temperature of 36° F. to 38° F. should be maintained in the store.

Another problem with which the apple grower is not concerned arises in the case of plums and other soft fruits—that is, the necessity for raising the temperature before removal from the store (which is usually known as defrosting) so as to avoid condensation of moisture which otherwise takes place, promoting the growth of moulds and rapid collapse of the fruit.

Before leaving the question of soft fruits some reference should be made to the alternative method of dealing with them by freezing. A good deal has already been done in this direction, but the method has up to the present been confined to fruits used in the preparation of jams and other conserves, for which it is eminently suitable.

The jam manufacturer is faced with the problem of manufacturing the whole of his output for the year in a very limited time, unless he can find some method of preserving the fruit and drawing on supplies as the market demands. And even if his facilities for manufacturing enable him to do so, he would have to lock up a large amount of capital in the form of sugar, the cost of which may amount to three times the value of the fruit.

As you are no doubt aware, this problem is at present dealt with to a considerable extent by preserving the fruit by means of sulphur dioxide, the use of which is still permitted by the Ministry of Health, and it remains to be seen whether the freezing process will ultimately supersede the use of this preservative. One can only say that the tendency these days is in the direction of the elimination of all such preservatives in foodstuffs generally.

VEGETABLES.

I have not yet referred to refrigeration as applied to vegetables, and have hardly time to do so. The problem arises chiefly in the storage of ships' provisions, and every modern passenger ship is, of

course, equipped with cold chambers for this purpose. There is no difficulty in preserving vegetables such as cabbages, cauliflowers and lettuces in first-class condition for four to five weeks, and a temperature of about 33° F. to 36° F. is recommended as giving the best results.

Certain vegetables do not take kindly to cold storage, and amongst these may be mentioned Brussels sprouts, cucumbers and tomatos. A good deal of research work has been carried out on the latter, during which it has been found that storage at low temperatures, such as 34° F., for more than three or four days appears to cause physiological changes which prevent the normal ripening of the fruit on removal from storage. Results obtained in the experiments alluded to above, carried out in 1898, gave much more satisfactory results, and it is thought that this may be accounted for by changes in the character of the fruit since that date.

That different varieties of the same fruit show great variation in their storage qualities is, of course, well known. This question is at present engaging the attention of those concerned with the banana industry, to the extent of establishing a research station for the special purpose of breeding new varieties which are immune from the ravages of the Panama disease, and determining the conditions of temperature under which the fruit can be safely brought to this country and placed on our market. Immune varieties are at present available, but many of them will not stand up to the conditions of transport at present in use.

I must now pass on to refrigeration in horticulture.

The data available on this subject are rather limited, mainly for the reason that this branch of refrigeration concerns what is really a luxury trade, and research stations which are, generally speaking, financed by public money have not been in a position to devote their energies in this direction.

Refrigeration is used for three purposes: Firstly, for the storage mainly of bulbs, to retard the normal flowering season and so to enable flowers to be produced at practically any season during the year; secondly, to accelerate the forcing of bulbs; thirdly, to harden blooms of all kinds before transport. The bulbs mostly subjected to cold storage are Lilies, especially *Lilium longiflorum*, and Lily of the Valley. The latter are kept at a temperature well below freezing-point—about 20° F.—and on withdrawal from the store they will flower within about 15 to 21 days.

The following data concerning the treatment of the bulbs may be of interest.

The bulbs are shipped over from Japan in September and October, and are at once put into cold storage. In the ordinary course of events the variety 'Formosum,' if not so treated, would flower at the end of February, and the variety 'Giganteum' in April, but if placed in storage for a minimum period of, say, three weeks after arrival, their flowering is accelerated to the extent of about two weeks in every

seven, thus enabling the grower to gain an appreciable period over his less enterprising neighbour and reap financial benefit accordingly.

Bulbs are kept in storage for most of the year and withdrawn so as to supply market demands as they arise.

The store is maintained at about 35° F. and it is important to avoid too dry an atmosphere, which has been found to reduce both the quality and quantity of flowers produced. They are packed in cases surrounded by soil and stacked much in the same manner as cases of fruit.

Owing to our more temperate climate, the necessity for the hardening of blooms does not arise in this country to the same extent as in America, where a cold store for this purpose is regarded as part of the necessary equipment of an up-to-date grower.

It is common practice in the United States to hold the despatch rooms at a temperature of about 40° F. to 45° F. and to leave the blooms in these rooms for about 20 to 24 hours before dispatch.

If blooms are to be kept for a considerable period a somewhat lower temperature is preferable, say 36° F., and under these conditions Narcissi, Tulips, Hyacinths and Irises may be kept for weeks, *Lilium candidum* for thirty days, Pæonies for a fortnight.

While dealing with the question of storage, mention should be made of the cutting of the stems of blooms required for storage. It has been found that blooms which have had their stems cut under water last considerably longer than those cut in the air, and this is very pronounced in the case of storage flowers.

During the last fifty years—in the period, let us say, when food commerce has been widespread over long routes and in vast quantities—systems of preservation have been devised in almost countless numbers for the purpose of holding foods in sound condition over longer periods than their normal constitution ordinarily permits. Among these innumerable processes a few have struggled through to apparent temporary success, but one and all have fallen into oblivion beside the one great system, viz. that of refrigeration—which has stood alone as Nature's own system, marching on from success to success in the universality of its application to all manner of food produce.

Refrigeration has become accepted as the world's great conserving agent because it is the only system which neither adds to nor takes from the commodities to which it is applied. Instead of impoverishing the natural properties and virtues of the foods submitted to its care, it holds intact, by the force which Nature has devised, even the delicate aroma, as well as all natural nutrition, possessed by those food commodities.

I am fully conscious of having dealt in a somewhat superficial manner with what is a very large subject, but if I have been able to arouse some interest in this intensely interesting aspect of agriculture and horticulture and to give you some insight into what can be and has already been accomplished, that is about as much as I can hope to do in the time at my disposal.

ORCHID GROWING FOR BEGINNERS.

By H. G. ALEXANDER, V.M.H.

[Read October 23, 1929; Mr. C. H. CURTIS, F.L.S., in the Chair.]

IN approaching my subject it is necessary to realize that the very word "beginners" suggests a simplicity, a freedom from scientific discussion and complex theory, and a certain limitation of outlook which gives rise to the disconcerting question: "What can I say that has not been said before, many times, either by others or by myself?"

And behind this most evident difficulty, others speedily become apparent. Not the least of them is the necessity for generalization where generalization is often unwise. But I hope, even in the course of this short paper, to be able to indicate a few of the pitfalls that beset the path of the beginner in Orchid growing, and very briefly to point out the most generally successful methods of dealing with the types of Orchid which, by reason of their brilliant and lasting flowers, hardy qualities, and comparative cheapness and ease of cultivation, most commend themselves to those who are thinking of commencing this fascinating branch of horticulture.

It is well to remember always that Orchids are the aristocrats of the floral kingdom—and capricious aristocrats. The beginner who would be successful in growing them needs constantly to observe and intelligently to consider them—as individuals, not collectively. But a will to achieve success goes a very long way, and, in the case of Orchids, is accompanied by the enthusiasm which their exquisite beauty cannot fail to evoke. And the reward for the additional care which their cultivation involves is truly an adequate reward. For nowhere else in the floral kingdom can be found such perfection of beauty, such wonderful diversity of shape and colouring, or such an intriguing realm of possibility.

It is a very far cry from the days of the early Orchid collectors—who risked their lives in jungles and swamps and mountains to bring back Orchid species for the delight of the few who could then afford to grow them—to the present day, with its plenitude of beautiful hybrid plants, which far exceed in variety and loveliness the wildest dreams of a generation ago. To be sure, collectors are still searching the remote corners of the earth in the hope of discovering new species, but romantic as is this aspect, the true romance of Orchids lies to-day in the efforts of hybridists who have, by patient research and yet more patient labour, guided the work of Nature to the obtaining of results which would have appeared almost incredible to the pioneers of Orchid growing.

In the early attempts at Orchid growing it was generally considered necessary to grow the plants in a humid, steamy atmosphere in more or less heavily shaded houses, which were supposed to imitate their

natural environment. The general idea seemed to be that they were delicate plants which must on no account be exposed to sunlight or fresh air. This fallacy has long since been exploded by careful study of their natural habits and surroundings. Orchids are *not* delicate plants—on the contrary they are, for the most part, comparatively hardy. They will survive treatment which would kill a great many reputed hardier greenhouse plants. As an example, consider a species imported to England from South America. It is detached (often not too gently) from the rock or tree upon which it is growing, dried in the sun, and packed into a rough native-made case for a more or less arduous journey to the nearest port. Then it has a long voyage under all sorts of uncongenial conditions, and possibly has to wait an auction sale upon arrival. By the time it reaches its purchaser it is in such a dried-up state that, to the casual observer at least, there seems to be no possibility of its ever regaining sufficient vitality to produce a flower. Yet with ordinary care, it will start again into wonderful life under artificial conditions and many thousands of miles from its native home.

And, though many Orchids like a warm, moist atmosphere, it has been proved that a plentiful supply of fresh air and sunlight (regulated, of course, by the law of common sense) is essential to their well-being. Most Orchids bloom more profusely in their native habitats when growing in positions which are more or less exposed to the full rays of the tropic sun. Indeed, when they have become established in densely shaded positions, as for instance upon the lower branches of thickly growing trees, they often do not flower at all.

As regards temperature, a number of Orchids in their natural state grow at very high altitudes, and while they have to submit to the direct heat of the sun during the hot season, it is not unusual during colder periods to find some of them covered with hoar-frost.

Considering only these few general examples, it is obvious that an attempt to imitate the atmosphere of the shaded depths of a tropical forest is, to say the least, unwise. I do not think it an exaggeration to say—and this applies particularly to beginners—that in the growing of Orchids far more plants are killed by excess of kindness than the reverse.

I have said that an intelligent consideration of Orchids is necessary to their successful culture. The grower must be guided more by his own gained experience than by hard-and-fast rules. He must get to know the individual likes and dislikes of his plants, rather than rely entirely upon textbooks and cultural notes, which must of necessity be somewhat generalized. But, given enthusiasm and an average of common sense, the beginner should acquire in time an instinctive knowledge of what is good and what is bad for his plants; when they are healthy and when they are not. In this respect appearances are sometimes deceptive, and it is easy, in the lack of sufficient observation and care, for the beginner to be deluded by successes which are not permanent. The aim of good growers should be to keep their plants in a consistently healthy condition, and not merely to achieve transient

effects which, sooner or later, must end in their serious depreciation, if not in their total loss.

Not a few instances of failure, with beginners, that have come to my notice, have been attributable to keeping too high a temperature. Nothing can more quickly injure the plants, and many would be far better in cooler quarters than are often allowed them. It is most important to see that the temperature at night is lower than that kept by day. High temperatures at night are most injurious to plant life, being absolutely contrary to natural conditions. As I have said, Orchids are particularly sensitive to atmospheric influence, and the best treatment in all other respects is insufficient unless this fact is borne in mind. With a few exceptions they thoroughly enjoy sun heat, if moisture and air are abundant, provided they can obtain cool night air for their recuperation after the heat of the day. At the risk of repetition I would stress this fact—*atmosphere is all-important.*

Light—which is less under our control than any other factor—is the very life of most plants. And another cultural detail in which Orchids are frequently mismanaged is in respect to shading. It is essential that growers should give special study to this point, especially in our climate, with its long dull winters and frequently dull summers also. The beneficent influence of light upon Orchids can be seen in the plants grown in it. As in their natural state, they flower more freely, and the enduring properties of the blooms are vastly increased. Often they will last twice as long as those of plants grown in shadier conditions. The plants are also hardier, and not as susceptible to the effects of other slight errors of treatment which they may have to undergo. It is not always possible to give those kinds which need a high temperature and constantly moist atmospheric conditions the quantity of air which they would receive in growing naturally, but it is possible to a considerable extent to remedy this deficiency by giving them as much light as they will safely bear. With plants under glass, light will counteract a deficiency of air in the same way that a good supply of air will often mitigate bad lighting conditions. Of course, I am not suggesting that any but a few Orchids will, under glass, bear full exposure to the sun, but light must be controlled, as far as is possible, to ensure that the plants get their maximum requirement. It is wrong to use shading to *obscure* the sun's rays, as is often done. It is sufficient to break the direct rays and diffuse the light. In my opinion light is a far more important factor than heat in the hardening of tissues and imparting to foliage that attractively robust appearance which, more than anything else, tells the good cultivator that all is well with the plant.

Air and light are, therefore, always the primary consideration, and it is impossible to devote too much care to ventilating apparatus which will admit of fresh air combining with heat and moisture to secure a buoyant and congenial atmosphere, and to the shading of the glass in such a manner that the plants get all the sun they require without being burned.

A point upon which I am approached more frequently than any

other is with regard to the watering of Orchids, an important operation that is so often, by the beginner, seriously mismanaged. It is, admittedly, a very difficult question, upon which even the most experienced practitioners sometimes go wrong. In watering a mixed collection this question becomes particularly acute, even when all the plants are in full growth. It is always necessary to make allowance for the condition and quantity of compost about the roots, and the comparative vigour of the plants. The majority of the terrestrial kinds require proportionately more water at the roots than do the epiphytic kinds, the latter having a greater capacity for drawing supplies from the atmosphere. The ability of epiphytes to take up little or much moisture is determined by the conditions under which they are grown. Light and air naturally enable any plant to take up more moisture by means of its roots, and these organs of nutrition must be in a suitable medium. Excess of moisture will cause the premature death of the young roots in process of formation, and will often result in the earlier death of the older roots as well. Rain-water is preferable for all plants as being purest and most natural, and Orchids, especially epiphytes, should receive no other.

A great deal of controversy has been excited by the question: "Can manures be used to advantage in Orchid growing?" For my own part, I consider the application of any form of manure a risky proceeding, particularly in dealing with rare and valuable plants. So far as feeding is in any way concerned, I always argue that, as most Orchids are plants of comparatively slow as well as small growth, they can take only a limited amount of sustenance, and any attempt to increase this by the aid of manures is all but certain to prove harmful in the end.

Root-bound plants of some of the strongly growing terrestrial Orchids may derive benefit from weak doses of liquid manure during the season of growth, but the principal disadvantage arising from the use of manures in any form lies in the fact that, once the practice is commenced, indiscretion may easily follow, and in the course of time the plants may be ruined by excessive applications.

Another frequent cause of trouble to beginners lies in the treatment of plants during their "resting period"—a term which is often misunderstood. It does not imply the necessity for a periodical shrivelling of the plant by the withholding of water and lowering of the temperature, but a compromise as regards temperature and atmospheric condition. The resting period of most Orchids takes place, more or less, during the winter, and as the temperature is lower and evaporation is consequently less rapid, it is then that the plants require less atmospheric moisture and water at the roots. The grower must be careful at this period to adapt the varying conditions so as to meet, as well as is possible, the differing requirements of his plants. For example, the distichous-leaved plants require more frequent watering during their inactive period than do the pseudo-bulbous kinds. But the impression existing in the minds of some growers that a severe drying of pseudo-bulbous Orchids is necessary to induce them to flower

is an entirely erroneous one. Orchids which are over-dried during the winter will often lose many of their leaves when the sap begins to circulate freely in the spring. On the other hand, too much moisture when the roots are inactive leads to damping, spot, and their attendant evils. The extent of the benefit to those Orchids which require keeping dry at the root during their season of rest is governed by the conditions under which they are grown. If they are cultivated on the common-sense principles indicated—having their full requirements of light and air—the leaves and pseudo-bulbs (especially of the evergreen kinds) will be solid and stout in texture, and better able to bear a lengthened period of drought without a shrivelling of the foliage to any injurious extent.

Beginners often ask what season is the best for potting Orchids. Here I would say that, in a large collection, one is more or less engaged in this necessary occupation all the year round. Early springtime is, however, the recognized period for a general overhaul of the plants, and, at that time, any plants which require re-potting should receive attention, except those which may be showing flower spikes. The latter, of course, should be allowed to remain until after they have flowered. If the plants are re-potted when the roots show signs of activity they are able to take advantage of the fresh, sweet compost, and seldom fail to do so. The operation of potting Orchids is not in itself difficult. Pots of a porous nature, usually employed as receptacles, and the broken crocks which are generally used for drainage, should be thoroughly clean. *Osmunda* fibre of the best quality has been proved the finest potting medium. Other necessary materials are fresh sphagnum moss, charcoal, coarse silver sand, and crushed crock for the epiphytic kinds, while the strong terrestrial Orchids require the addition of good turfy loam of a not too sandy nature. The chief consideration in potting is to secure perfect drainage. The more water a plant requires, the better should the drainage be, to avoid souring the compost.

Over-potting must be avoided, and the rooting material must be worked firmly and carefully about the roots. Loosely potted plants are rarely satisfactory, as loose compost will retain too much moisture. Obviously it is not the quantity of water given to a plant which influences it for good, but the amount absorbed and retained by the compost. As the healthiest plants are those which require the most frequent watering, the compost should be firm and on a well-drained bottom.

Potting time is a very convenient season for giving special attention to the removal of useless leaves, stems, and pseudo-bulbs. At this point a few remarks upon the main characteristics of growth may be of interest to the beginner. It is in the renewing of their tenure of life that Orchids differ from other plants, and, upon a brief acquaintance with them, Nature's special provision for their continual existence becomes apparent.

In the bulbous species the roots which nourish the plants are mainly confined to the newly-made pseudo-bulbs, the roots of the old bulbs

dying after a lapse of time. There is in this way a process of constant renewal. Under cultivation the plants in no way suffer from the death of the old roots, as the removal of the old pseudo-bulbs results in giving the new bulbs the full benefit of the root action.

When it is desired to propagate a variety, the bulbs removed may be potted up, if the eyes are sound, and in due time useful plants may be secured from material which, if not removed, would have been detrimental to the health of the parent plant.

In the *Vanda* tribe of bulbless species the natural provision for existence is equally apparent. In these the lower portions of the stems die gradually upward, but the upper parts are quite independent of the dead portions below, the removal of which brings the plants again into direct contact with their sources of nourishment.

The removal of the old and often worn-out portions from the plants is one of the best means of keeping them vigorous and in the best condition for resisting disease and insect pests, to which, like other greenhouse plants, Orchids are subject.

A very large proportion of the diseases and insect troubles which affect Orchids can be traced to errors in cultivation, particularly in the regulation of temperature and ventilation. Unhealthy atmosphere lowers the vitality, and plants, like human beings, are an easy prey to disease when their environment is uncongenial.

Periodical spraying with or dipping in some safe insecticide is the best means of keeping Orchids clean and free from Thrips and Scale, which are perhaps the greatest enemies of the Orchid grower. An occasional fumigation with a good nicotine preparation is also effective, but no plant likes it, and it should be done only when it is absolutely necessary.

To come to the matter of accommodation. If they are careful in their original selection of plants, beginners, starting with only one house of Orchids, can derive pleasure from them proportionate to that of the owner of a large collection. The single house has often been the starting-point of more extensive cultivation. Indeed, Orchid growing can be—and often is—commenced in an existing plant house with very little, if any, alteration. The chief provisions necessary are well-regulated heating apparatus, efficient shading and adequate ventilation, storage for rain-water, a natural earth floor, and open woodwork staging upon which to grow the plants. The arrangement of the hot-water pipes will sometimes necessitate the provision of a second staging, covered with moisture-holding material, immediately above them. If so there should be ample space between this and the open wood staging to permit of a free circulation of air. This provision of air space beneath the plants is distinctly to be recommended in the growing of nearly all Orchids.

The next point is the consideration of what types of Orchid are best to grow. For the beginner I always recommend a strict adherence to the best known and most easily cultivated kinds, a careful selection being made to suit the house in which they are to be grown. *Cymbidiums* are among the most popular Orchids of to-day. They

may be grown by anyone with an ordinary greenhouse, and, with cool treatment, no Orchid is more cheaply or easily cultivated. The interesting and distinct family of *Cypripediums* are also among the easiest of Orchids to grow, even when there are no special facilities for their cultivation.

Where the beginner can devote a house entirely to Orchids, I would advise that it should have an intermediate temperature. In such an intermediate house, with a minimum temperature of 50° in winter, a large number of showy Orchids can be successfully grown at a reasonable cost. Such Orchids as require greater heat should, of course, be carefully avoided, for, while the cooler-growing kinds will grow in an atmosphere warmer than that to which they are generally accustomed, the hothouse varieties will prove disappointing in a temperature that is too low for the proper development of their growth.

Cymbidiums, *Odontoglossums*, *Odontiodas*, *Oncidiums*, *Miltonias*, and other favourite cool-growing Orchids can be arranged at the cooler end of the intermediate house, while *Cattleyas* and their allied genera, *Cypripediums*, *Dendrobiums*, and a number of other popular and interesting kinds will thrive satisfactorily in the warmer portion. In fact, very good results have often been obtained from the accommodation of a mixed collection of Orchids in a single house.

The actual choice of plants by the beginner will depend, of course, upon his individual preferences, his available accommodation, and the amount which he is prepared to spend. I shall, therefore, make no attempt to detail further the many attractive varieties which await his choice, but he will find that experienced growers, whether amateur or professional, are always ready with helpful advice, and a visit to an established collection will afford him considerable assistance in making a beginning.

Perhaps it may seem to the would-be Orchid grower that the subject bristles with difficulties, but, as I have said, if enthusiasm and common sense are brought to bear upon it, the successful growing of many kinds of Orchid is no more difficult than achieving success in any other branch of horticulture. Sympathetic consideration of the plants is essential, but the glowing wonder of the blooms which in due time will delight the eyes of the grower will be a more than adequate compensation for his care. By judicious arrangement some plants may be had in flower during nearly all the year, but principally when English gardens are desolate under leaden English skies. And, whether on the plant or in a cut state, the lasting qualities of Orchid flowers are approached by but few others.

Orchid growing is no longer confined to the few, it is a delightful occupation for the many. Its increasing popularity, which has occasioned the continual improvements that are being effected in the production of the numerous beautiful and inexpensive hybrids, makes possible the entry of the veriest beginner in horticulture into this kingdom of delightful achievement and entrancing possibility.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

LV.—SOME EXPERIMENTS WITH ULTRA-VIOLET RAY GLASSES.

By M. A. H. TINCKER, M.A., M.Sc.

THE question of the value of glass which permits the passage of ultra-violet rays to growing plants is frequently put to us. The following account of experiments made at Wisley during the past two or three years will therefore be of some interest.

Rays from the sun visible to the human eye have wavelengths varying between 8,000 and 3,900 Ångström units,* but there are rays with both longer and shorter wavelengths, the infra-red and the ultra-violet rays respectively, which are invisible to the human eye.

Ordinary glass permits the passage of rays down to a wavelength of 3,200 Å.U., but glass has now been made which passes still shorter rays. Vita glass, for instance, passes rays as short as 2,910 Å.U. Thus plants growing under such glass would receive more of the short-wave ultra-violet rays than those under ordinary glass. The question is: Have these rays any appreciable effect upon the growth of plants? In all other respects the new glass is essentially the same as ordinary glass.

The glass used in these experiments was of three kinds; ordinary 21-oz. glass; Vioray glass, presented for experimental purposes by Messrs. WITTING BROS., LTD., of 49 Cannon Street, E.C.; and Vita glass, similarly presented by Messrs. PILKINGTON BROS., LTD., St. Helens.

These glasses were used to glaze six frame lights (two of each kind), each 6 feet by 4 feet, facing south. The soil at the back of the frames was 2 feet from the glass and 10 inches in front. The frames were in a row separated from one another by close-fitting wooden partitions.

The ordinary glass averaged $\frac{1}{8}$ inch in thickness, the other two glasses approximately $\frac{1}{10}$ inch. To ensure that dust, etc., did not interfere with the passage of the rays the glass was washed almost daily.

The soil used was thoroughly mixed before putting into the frames, so that every frame received exactly the same kind and quantity of the compost. All cultural operations, including watering, were carried out in exactly the same way for each set of frames.

Maximum-minimum and ordinary thermometers were placed in each frame, supported below the leaves of the plants, so that the readings taken showed the temperature of the air around the leaves. With the frames closed, small differences in temperature under the different glasses were repeatedly observed. In bright sunshine the air temperature under Vita glass was 4° or 5° F. higher than that under ordinary glass. The soil temperature at the surface was about 2° F. higher. In dull weather the temperature in all the frames was the same for all

* An Ångström unit (Å.U.) = one ten-millionth part of a millimetre.

practical purposes. In some of the experiments these differences in temperature were eliminated by opening the lights slightly as required. In winter the frames were gently heated by large hot-water pipes, and the temperatures were then found to be the same at equal distances from the pipes in all the frames. Occasionally irregularities, due to pests, etc., occurred which would have made comparisons unfair, and the experiment was at once discarded and is ignored in what follows.

Growth was measured by weighing the fresh plants within ten minutes of their removal from the soil, and also by estimating the material the plants had actually gained apart from water. This is called, below, the dry weight, and was ascertained by drying three samples, each of about 50 grammes, in an oven, until all water was driven off. This was done for every frame for each experiment. The result is expressed in the tables as a percentage of the total fresh weight.

EXPERIMENTS.

1. *Winter. Frames heated and kept closed. Temperature equal in all frames. Radish.*

Seed of Forcing Radish was sown in drills on November 11. The seedlings were thinned to 2 inches between the plants. The crop was removed, cleaned, and weighed on March 8, ten plants being weighed together. After separation into roots and tops, small samples were dried. The results are as follows :

	Fresh weight of roots, 10 plants (average).	Fresh weight of 10 plants (average).	Percentage dry matter.		Ratio: Roots/tops.
			Roots (average).	Tops (average).	
Ordinary glass (175 plants)	30.05 gms. ± 2.00 *	56.3 gms. ± 1.95	5.42 ± 0.14	7.43 ± 0.76	0.84 ± 0.02
Vioray glass (180 plants)	31.75 gms. ± 2.10	60.5 gms. ± 2.4	5.64 ± 0.14	7.84 ± 0.17	0.79 ± 0.01

The figures in heavy type indicate the value of the part for which the crop is grown. In this experiment for all practical purposes the plants grown under the two types of glass were equal.

* Despite the utmost care in carrying out an experiment in the garden, it is almost impossible to obtain crops from adjacent plots treated precisely alike which will be of exactly the same weight. Therefore when the plots have received different treatments the differences found in the weights must be sufficiently large to be outside the limits of such chance variation before they can be relied upon, or be likely to recur in similar circumstances.

Without entering into the mathematics concerned, it may interest the reader to know that the figure "± 2.00" is called "the probable error" of the average (30.0), and it shows the limits (28-32) within which one can with good reason expect as often as not a similar reading to lie. A figure far outside these limits would be of much more unlikely occurrence. The difference found between the averages of two crops must therefore be larger than this measure of likely variation if it is to demand serious consideration. In practice, if the probable error of two averages is of a similar size and a difference more than three times as large as the probable error is found, the chances are that such a large difference "really does matter," and that it is likely to recur again under similar circumstances because it is not merely due to chance variation. Generally without such figures we cannot tell whether a fairly small difference between two crops is likely to be obtained again in the same circumstances or not.

2. *Spring Frames heated and kept closed. Temperature towards end of period higher by 3° or 4° F. on bright days under Vioray and Vita glass. Radish.*

Seed of the same variety of Radish as used in 1 was sown on May 2; the other details were as in experiment 1. The crop was removed on June 1, and the following information was obtained:

	Fresh weight of roots, 10 plants (average).	Fresh weight of 10 plants (average).	Percentage dry matter.		Ratio: Roots, tops.
			Roots (average).	Tops (average).	
Ordinary glass (150 plants)	30.2 gms. ± 1.35	56.7 gms. ± 2.25	5.58 ± 0.2	7.33 ± 0.2	0.85 ± 0.02
Vioray glass (160 plants)	40.3 ± 2.5	70.6 ± 4.75	5.39 ± 0.19	7.12 ± 0.2	1.00 ± 0.03
Vita glass (150 plants)	41.2 ± 3.0	69.45 ± 4.35	5.21 ± 0.22	7.84 ± 0.22	0.98 ± 0.02

In this experiment the plants grown under the new glass were heavier, their roots were larger, and more dry matter was contained in their roots as compared with their top growth, than in the roots of plants grown under ordinary glass. The probable influence of the increased temperature must be taken into account.

3. *Summer. Frames closed. Lettuce, Early Paris Forcing.*

This experiment was designed primarily to test the temperature relations under summer conditions of the three types of glass. Seed was sown on June 6. The frames were kept closed except for the short time necessary for cultural operations. Selected days will serve as examples of the differences in temperature recorded:

	Very bright day, sunshine. Maximum.	Dull day with bright periods. Maximum.	Dull day, cool night. Minimum.
Ordinary glass . . .	98° F.	89° F.	51° F.
Vioray glass . . .	104.5° F.	91° F.	52° F.
Vita glass . . .	104° F.	92° F.	51° F.

These figures show that on bright days significant differences in temperature occurred. On dull days the difference was much less. The difference in thickness of the glass, although so small, may account in part, at least, for the temperature difference. A report from the Watford Physical Laboratory states that there is no difference between the ordinary and the new glass in heat transmission. In our winter experiments the frames were heated, but it is reasonable to suppose that the frames in which the temperature rose more rapidly in summer would also cool more quickly in winter.

The plants in the different frames showed no obvious difference in size or rate of growth. None showed signs of scorching.

Following this experiment tests were made to eliminate the temperature differences by regulation of the opening of the frames by wedges.

4. *Summer. Frames wedged open as necessary to equalize temperature. Lettuce, Early Paris Forcing.*

Seed sown July 31. Seedlings thinned August 10, and again later to 8 inches. The plants were allowed to grow until September 18 in order to see whether bolting was more rapid under one glass than another. They were lifted, cleaned, and weighed individually. Throughout the time the plants were fully exposed to the sun. When the plants were lifted a higher percentage of those under the Vioray glass had begun to bolt than in the other frames.

	Fresh weight of plant without roots (average).	Percentage dry matter in tops.	Percentage beginning to bolt.
Ordinary glass (130 plants)	65.3 gms. ± 2.6	4.59 ± 0.09	34.5
Vioray glass (125 plants)	66.9 gms. ± 3.9	4.29 ± 0.12	59.0
Vita glass (130 plants)	50.2 gms. ± 3.6	5.28 ± 0.15	31.0

The figures show that the plants grown under Vita glass in summer were smaller when the temperature was kept practically equal; and those under Vioray glass, while equal in weight to those under ordinary glass, were bolting more quickly. The increase in length of the stem was accompanied by an increase in the water content (decrease in the percentage of dry matter).

5. *Autumn. Temperature under new glass higher at beginning of experiment. Radish, Forcing.*

Seed sown October 13. After thinning the plants grew until December 3, when they were lifted and weighed. During the latter half of the time the frames were closed and heated and the temperature was approximately equal in all of them.

	Fresh weight of roots, 10 plants (average).	Fresh weight of 10 plants (average).	Percentage dry matter.		Dry matter ratio: Roots/tops.
			Roots.	Tops.	
Ordinary glass (170 plants)	39.6 gms. ± 1.95	81.6 gms. ± 3.15	5.05 ± 0.16	8.46 ± 0.17	0.56 ± 0.03
Vioray glass (175 plants)	61.15 gms. ± 4.8	104.3 gms. ± 5.7	5.48 ± 0.19	8.56 ± 0.17	0.93 ± 0.04
Vita glass (170 plants)	49.5 gms. ± 2.6	86.4 gms. ± 4.3	5.41 ± 0.19	8.51 ± 0.16	0.86 ± 0.03

The figures show that the plants under the Vioray glass were (as total plants) slightly larger. The roots of the plants under both Vioray and Vita glass were heavier than those under ordinary glass. The ratio (dry weight) of roots to tops was greater under the new glasses.

6. *Winter. Frames closed, heated, temperature equal in all. Radish, Forcing.*

Seed sown December 11 as a repetition of Experiment 5. After thinning, the plants grew until March 27.

	Fresh weight of roots, 10 plants (average).	Fresh weight of 10 plants (average).	Percentage dry matter.		Dry matter ratio: Roots; tops.
			Roots.	Tops.	
Ordinary glass (190 plants)	22.25 gms. ± 2.7	43.8 gms. ± 1.2	5.62 ± 0.1	7.51 ± 0.12	0.76 ± 0.02
Vioray glass (180 plants)	36.0 gms. ± 2.4	55.6 gms. ± 1.45	5.58 ± 0.09	7.83 ± 0.2	1.04 ± 0.04
Vita glass (190 plants)	37.6 gms. ± 2.7	59.2 gms. ± 1.6	5.43 ± 0.08	7.97 ± 0.15	1.20 ± 0.04

The plants grown under the new glasses were heavier (fresh weight) and their roots larger than those under ordinary glass. More dry matter was found in the roots than in the tops of the plants grown under the new glass, whilst under ordinary glass the tops were heavier when weighed dry.

7. *Spring. Frames wedged open as necessary to equalize temperature. Lettuce, Early Paris Forcing.*

Seed sown April 4. The plants, duly thinned, grew until June 13, when they were lifted, cleaned, and weighed.

	Fresh weight of plants. (average).	Percentage dry matter (average).	Percentage beginning to bolt.
Ordinary glass (140 plants)	48.9 gms. ± 1.9	4.68	38.0
Vioray glass (120 plants)	50.7 gms. ± 1.4	4.63	37.5
Vita glass (120 plants)	47.5 gms. ± 1.2	4.91	37.0

The plants in all the frames were equal in dry weight as well as in fresh. An equal percentage had begun to bolt.

8 and 9. *Summer. Opening of Frames regulated to make temperature equal. Cucumber, Telegraph.*

Small Cucumber seedlings were planted in the frames early in July. The leaves of plants grown under Vita glass and Vioray for a period of three weeks without shading appeared more "scorched" than those under ordinary glass. The leaf margins became slightly rolled, the leaf appeared brown at the centre of the blade, the epidermis broke from the tissue below to produce a temporary "silvering" appearance quickly followed by brown discoloration.

Experiment 9 formed an immediate repetition of No. 8, the seedlings being planted at the end of July. The plants grew well, and the leaves of the plants under Vita glass and Vioray did not again appear scorched. No visible differences were apparent between the plants of the three series. The total fresh weight of the plants grown under Vita glass were within 0.5 per cent. of that grown under ordinary glass; the plants grown under Vioray glass were slightly lighter (3 per cent.) in weight. No statistical evidence was obtained because of the few plants it was possible to grow, so that no significance is attached to this difference. The production of fruit in the various series was for practical purposes the same.

10 and 11. *Frames closed, temperature unequal. Carrots.*

Seed sown on June 8. The growth of the plants, particularly the roots, under Vioray glass appeared to be larger. No statistical data were obtained.

Experiment 11. A further test was made with Vioray glass in late summer and autumn. The plants were lifted when still very small in early autumn.

	Weight of 10 plants (average).	Ratio : Roots/tops. Fresh weights.
Ordinary glass (500 plants) . . .	56.77 gms. ± 9.4	6.34 ± 0.67
Vioray glass (460 plants) . . .	87.30 gms. ± 6.2	8.30 ± 0.60

The plants under Vioray glass were heavier and had relatively larger roots. The results generally resembled those obtained with Radishes. The temperature factor was not controlled in this experiment, so that part of the observed difference, if not all, may have been due to difference in temperature.

SUMMARY OF EXPERIMENTS.

It will be convenient to group the results together in a summary. In the table the weight of the crop made by the plants grown under Vioray glass and Vita glass is expressed in terms of that made by plants under ordinary glass calculated at 100 in every case.

Radish, Forcing. The growth measured was the fresh weight of roots.

Expt.	Growing period.	Temperature conditions.	Ordinary glass.	Vioray glass.	Vita glass.
1	4/11-8/3	Equal . . .	100	105 *	—
2	2/5-1/6	Equal at first, unequal later.	100	133 †	136 †
5	13/10-3/12	Unequal at first, equal later.	100	154 †	124 †
6	11/12-27/3	Equal . . .	100	162 †	169 †
		Average . . .	100	138 †	143 †

Lettuce, Early Paris Forcing. The growth measured was the fresh weight of top growth.

Expt.	Growing period.	Temperature conditions.	Ordinary glass.	Vioray glass.	Vita glass.
3	11/6-22/7	Unequal . . .	—	—	—
4	31/7-18/9	Equal . . .	100	102 *	77.0 †
7	4/4-13/6	Equal . . .	100	103 *	98.0 *
		Average . . .	100	100	87.5

Cucumbers. Growth measured, total fresh weight.

Expt.	Growing period.	Temperature conditions.	Ordinary glass.	Vioray glass.	Vita glass.
8	1/7-24/7	Equal . . .	" Scorch "	" Scorch "	—
9	26/7-4/9	Equal . . .	100	99 *	96 *
		Average . . .	100	100	100

* Difference insignificant.

† Difference significant.

Carrots. Growth measured, fresh weight of roots.

Expt.	Growing period.	Temperature conditions.	Ordinary glass.	Vioray glass.	Vita glass.
11	8/9-9/11	Unequal	100	156 *	—

From this summary it is apparent that a significant increase in the weight of radish and carrot roots was obtained by using the Vioray and Vita glass, but part of this increase was probably due to temperature differences in the frames. The total increase, about 33 per cent., was not phenomenal. With lettuce the plants grown under Vioray and Vita glass in summer were the same weight as those grown under ordinary glass when no temperature differences interfered with the results. The small tests with cucumbers did not reveal any advantage due to Vita glass or Vioray glass, under which the leaves were once scorched by the sun's rays in midsummer.

In none of the experiments with radish and lettuce were marked differences observed in the rate of germination under the three glasses when the temperature was equal in all the frames.

The results recorded here deal with only a few species. A critical consideration of the reports of other investigators who employed further species may prove of interest, but at the present time these reports available are somewhat of a preliminary nature.†

KERR RUSSELL ‡ reports that seedlings (species not stated) when screened with Vita glass germinated and produced sturdier plants than did others under ordinary glass. From the details given it is not possible to judge whether the resulting differences in size observed were due to the temperature, or whether the ultra-violet rays accelerated either the germination or subsequent growth. Some preliminary data from the experiments at Kew § are also available, from which it is seen that seed sown under Vita glass germinated twenty-four hours earlier than did controls under ordinary glass. The subsequent seedlings—particularly lettuce—appeared sturdier and darker. An appreciable difference in the temperature of the two series, amounting to some 2° F. to 6° F., was recorded. This may or may not be due to the thickness of the two kinds of glass. Such differences in temperature would, of course, affect the growth. SALEEBY, || in a brief note upon the lettuce grown at Kew, tells us that an increase of some 15 per cent. over the controls was made by plants grown under Vita glass. No significance can be attached to this result as only six plants were weighed, and possibly these were weighed together. We must therefore wait for the full detailed report. A preliminary note on the trials conducted at Westfield College, ¶ “where various South African plants are being raised for bedding,” indicates that the production of flowers

* Difference significant.

† COLMAN, Sir J., “Vita Glass,” *Gard. Chron.*, 81, p. 237 (1927).

‡ “Vita Glass,” *Gard. Chron.*, 81, p. 218 (1927).

§ [Kew.] “Experiments with Vita Glass,” *Gard. Chron.*, 81, p. 314 (1927).

|| SALEEBY, C. W., “Growth of Plants under Vita Glass,” *Gard. Chron.*, 81, p. 452 (1927).

¶ [Westfield College.] “Vita Glass Tests,” *Gard. Chron.*, 83, p. 462 (1928).

was accelerated under the new glass. No temperature figures are stated. THOMSON * reports that tomatos grown under Vita glass at Bathurst (New South Wales) suffered injury. This was probably due to the excessive heat of the frames. MADDOCK † reports that in spring tomatos grew more rapidly under Vita glass than in a warmer house under ordinary glass, but later these plants did not seem so healthy.

From this brief review we may conclude that the temperature under Vita glass is slightly higher than under ordinary glass. This may lead to accelerated growth, or may cause injury in very bright sunshine of summer or in other climates. Naturally species respond differently to temperature conditions, some being sensitive, others relatively indifferent. In our own experiments when the temperature was controlled there was no appreciable difference in the growth of lettuce under the new glass. Where an acceleration of the growth of lettuce is reported it may be considered to have been due to temperature differences.

Reference must be made to the use of artificial sunlight lamps emitting ultra-violet rays ; the effect of such energy upon plant growth has now been studied in this and other countries. DELF, ‡ MARTIN, § and WESTBROOK || employed a Hewittic ulviarc quartz mercury vapour lamp, the spectrum of which shows lines in the ultra-violet region. Between the lamp and the plants, situated sufficiently far away to avoid local heating effect, various screens were placed. Vita glass was thus tested. Briefly, the general results indicated that with even such short daily periods of exposure as ten, five, two minutes, or one minute at 3 feet for a period of five weeks, definite harmful effects resulted from irradiation in the case of *Arachis* and *Voandezia*. With short daily periods of irradiation of thirty seconds' duration a stimulating effect was observed with *Trifolium* and *Pelargonium* species. The difficulty of obtaining equal intensities for comparison of the effect of light of different wavelength precluded more general conclusions being dealt with. As a result of this investigation it is interesting to note that these observers estimated that some 20 per cent. to 30 per cent. of the ultra-violet rays of wavelength 2,900 Å.U. passed through their Vita glass screen. One interesting feature of their results was that the injury produced by the exposure to ultra-violet rays was greater when the total daily period of the daylight enjoyed by the plants was short. They also report that the insertion of the screens that cut off the very short rays more frequently resulted in a stimulation of growth. A Vita glass screen prevented injury to French beans. One symptom of injury is the collapse of the epidermis due to the action of the rays of

* THOMSON, R., "Tomatoes under Vita Glass," *Agric. Jour. N.S.W.*, **39**, p. 596 (1928).

† MADDOCK, O., "Vita Glass (Tomatos)," *Gard. Chron.*, **84**, p. 434 (1928).

‡ DELF, E. M., "Effect of Ultra-Violet Light on Plants," *Brit. Jour. Actinotherapy*, **2**, p. 106 (1927); *Lancet*, 1927, p. 794.

§ MARTIN, M., "The Influence of Ultra-Violet Light on the Structure of Plants," *Rep. Brit. Assoc., Leeds*, 1927.

|| WESTBROOK, A., "The Influence of Ultra-Violet Light on the Growth of Plants," *Rep. Brit. Assoc., Leeds*, 1927.

very short wavelength. ELTINGE* used a somewhat similar quartz mercury vapour lamp; and screens including Vita glass were inserted between the plant and the lamp. A wide range of plants was tested under greenhouse conditions, including forcing lettuce, dwarf bean, sweet potato, tobacco, maize, and early scarlet turnip. It was frequently observed that at 50 inches and 100 inches from the lamp the leaves were injured. Blistering, rolling, and discoloration of the leaf took place. With lettuce the newly formed leaves were smaller and fewer. When a Vita glass screen was inserted the lettuce plants produced more leaves than did others which were not irradiated. A similar response was obtained with sweet potato. The screened light also accelerated the growth of radish, Coleus, maize, and other plants. At a distance of 100 inches from the lamp with the Vita glass screen an increased rate of growth was reported with a number of species including tobacco, lettuce, maize, and radish. A quartz screen not only prevented injury but prevented stimulation as well.

From these experiments the conclusion is drawn that very short rays from mercury vapour lamps injure the tissues. Short daily exposures to ultra-violet rays of some thirty seconds' duration may accelerate growth. The intensity of the energy received by the plant was not estimated. The beneficial rays pass to a certain extent through Vita glass, the shorter injurious rays do not. Injury is caused by the close proximity of the plants to mercury vapour lamps.

CONCLUSION.

Vioray and Vita glass were tested. The temperature in summer was higher under these types of glass than under ordinary glass, but when controlled the rate of growth of lettuce was not influenced, but radishes and carrots produced a heavier crop of roots under the new glasses.

It is my pleasant duty to express my thanks to the Director, who placed at my disposal the facilities necessary for this work.

* ELTINGE, E. T., "The Effect of Ultra-Violet Radiation on the Higher Plants," *Ann. Miss. Bot. Gard.*, 15, p. 169.

"Ultra-Violet Light and Horticulture," *Gard. Chron.*, 81, p. 52 (1927).

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

LVI.—FURTHER INVESTIGATIONS ON THE EELWORM DISEASE OF PHLOXES.

By G. FOX WILSON, N.D.H., F.E.S., Entomologist.

INVESTIGATIONS into the Eelworm Disease of herbaceous perennial Phloxes, *Phlox decussata*, were commenced in 1921 on the suggestion of the Director of Wisley, and a preliminary paper has already appeared.* Since the publication of that paper, these investigations have been continued along different lines, whilst attempts have been made to clear up the somewhat intricate phases of the life history of the Stem Eelworm, *Tylenchus dipsaci* Bastian (*devastatrix* Kühn). Although work on this pest is still being continued for the purpose of arriving at a fuller understanding of the problem, sufficient information has been gathered to warrant the publication of the results already obtained.

In addition to those whose names were mentioned in connexion with this disease in our former paper, we may add those of SCHWARZ,† who describes the disease on plants received from Hanover, RITZEMA Bos ‡ and SORAUER.§

Symptoms of the Disease.

There are many symptoms connected with the attack of this species of eelworm in herbaceous Phloxes, and whilst some plants exhibit all of those described below, others exhibit only two or three.

1. The leaves are very narrow, crinkled and waved at the edge (figs. 15 and 16) and often brittle, with a tendency towards lengthened petioles.
2. The epidermis of the leaf separates from the underlying tissues and an inflated appearance results (fig. 16B).
3. The stems are spindly and brittle with long internodes (fig. 15), or stunted, swollen and soft.
4. The stem splits (fig. 15).
5. Basal buds are produced in profusion (fig. 20).
6. Nodal and internodal areas in freshly infected young plants are swollen (fig. 17).

The range of abnormality in the leaves is very wide and the variation is from the crinkled and rolled condition to the spindly growths

* G. FOX WILSON, *R.H.S. Jour.*, 49, 1924, pp. 203-210.

† *Mitt. K. Biol. Anstalt. für Land- und Forstw.*, vol. xii. 1912, p. 26.

‡ *Tijdschr. Plantenziekten*, Wageningen, vols. v.-vi. 1899, Part 86, pp. 27-32.

§ *Handbuch der Pflanzenkrankheiten*, vol. iv. 1925, p. 18.



FIG. 15.—EELWORM DISEASE OF PHLOX.
(For references to symptoms see text)



FIG. 16.—EELWORM DISEASE OF PHLOX.
A, Healthy leaf; B, Abnormal leaves from infected plant.



FIG. 17.—SWOLLEN NODAL AND INTERNODAL REGIONS IN FRESHLY INFECTED
YOUNG PHLOX PLANTS.



FIG. 18.--*OENOTHERA FRASERI* INFECTED WITH THE STEM EELWORM,
SHOWING ANGLED GROWTHS AND INTERTWINING SHOOTS.

where the leaf tissue has almost entirely disappeared and the lengthened petiole remains (fig. 16B).

Heavily infected plants either fail to set seed or, if seed is set, a large percentage of it is sterile.

The formation of spindly growths and long internodes may be induced by weakness, whilst the cracking of the stem (which is not by itself symptomatic of eelworm attack but may be due to excessively dry conditions in the soil) is probably due to unequal growth and the massing of large numbers of eelworms in a confined area in the cortical cells lying immediately beneath the epidermis.

Symptoms of attack in *Oenothera Fraseri* are somewhat similar to those found in Phloxes, but the most characteristic malformations in this plant are the angled growths and the intertwining of the younger shoots (figs. 18, 20).

The Biology of Tylenchus dipsaci in Herbaceous Phloxes.

Infection takes place primarily from the soil, by eelworms which are already there or have been carried there in infected plants, soil adhering to plants, manure and other decaying organic matter, garden tools and the boots of persons walking over infected areas, soil-water from surface drains following heavy rains and floods having washed the eelworms from infected land, the voluntary migration from infected to non-infected areas, and high winds carrying the desiccated eelworms. Penetration is effected through the epidermal layer of the underground stem and young shoot and by eelworms which have made their way beneath the scales of dormant buds in early spring. It has been conclusively proved that this species of eelworm can directly penetrate healthy living tissue of plants, but they also effect an entrance through wounds in the stem made by soil pests or carelessly used garden tools.

So soon as growth commences the eelworms make their way up the growing shoots in the cortical cells (fig. 21) and more especially in the cells immediately underlying the epidermis (fig. 19), and often in such numbers as to cause rupture of these cells so that the eelworms may be found protruding from them. We have failed to find the cortical cells damaged in any mechanical way and few of the cells are emptied of their contents. We are inclined to think that the injury is due to a toxin rather than mechanical. STEINER* suggests that the eelworms eject into the tissues a liquid substance, presumably a secretion of the strongly developed salivary glands. It is the influence of this secretion that causes the plant to react in various ways, such as the production of swollen and curled growths, canker-like outgrowths and swollen and crinkled leaves. The excretions, also, of these internal parasites may stimulate to reaction or at least influence the plant cells in their behaviour.

The effect of low temperatures and cold winds during the early

* *Phytopathology*, vol. xv. 1925, No. 9, pp. 499-534.

stages of growth is to produce a serious check to the plants, whilst the check to the eelworms within the tissues is less apparent, with the result that infected plants subjected to unfavourable weather conditions in early spring are crippled to a far greater extent than infected plants whose growth is unchecked. As the numbers of eelworms increase in the shoots of plants whose growth has been checked the shoots often die, in which case the eelworms leave them and enter the soil and migrate to fresh hosts.

If the numbers of eelworms invading a healthy plant are few the plant may show little outward sign of the disease, but if many have made their way into it some or all of the symptoms described will be evident.

All stages of the eelworm may be found within the tissues from April to September, the eelworms reaching their maximum numbers

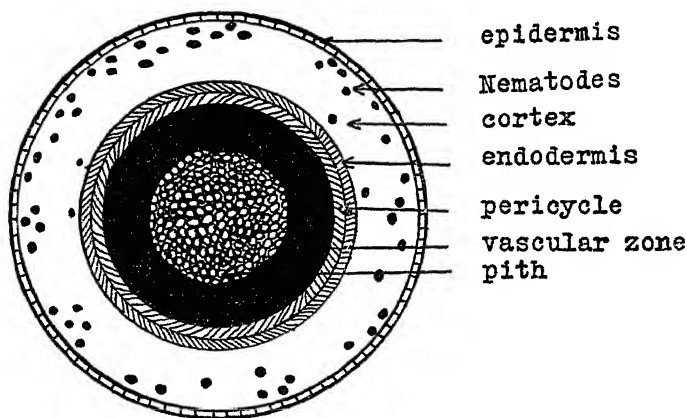


FIG. 19.

in July, when they may be found in abundance in the stems, less frequently in the petioles, leaves and flowers. They have not been discovered in the seed of any species of *Phlox*.

As the stems die down the eelworms are found descending in great numbers in the pith cells and making their way down to the underground stems and soil. Should the shoot die and dry up quickly as a result of prolonged drought, the eelworms are imprisoned in the dead stems and become quiescent and are found in a desiccated condition among the powdery pith cells. Dead stems of *Phlox Drummondii* containing desiccated eelworms were placed in wool-plugged test-tubes on July 17, 1924. On November 25, 1929, the eelworms and dried-up pith cells were immersed in water, when, within fifteen minutes, about 65 per cent. of the eelworms became uncoiled and straightened out. Within twenty-four hours about 8 per cent. of the pre-adult larvae had become active, after remaining quiescent for five and a half years. GOODEY* carried out similar

* *Jour. Helminthology*, vol. i. 1923, pp. 50-52.

investigations with the same species obtained from Onion and Narcissus bulbs, and states that 50 per cent. of the eelworms remained for a period of two and a quarter years capable of resuming activity. The effect of this capacity for remaining inactive but alive for prolonged periods is that infected Phlox stems cut off and thrown on to a rubbish heap or odd corner of the garden under conditions which allow for the survival of the eelworms may be returned to the soil along with other decaying organic matter as manure and prove a source of infection. This danger may be eliminated by either burning the infected stems or subjecting them to correct disposal by tightly packing the infected material and hastening decay by dressings of sulphate of ammonia, so that the heat which is generated by bacterial activity raises the temperature of the stack to 120° F. Infected stems stacked in heaps with and without the addition of sulphate of ammonia have shown that the latter method will destroy the adults and their eggs provided the temperature is raised above 115° F., a figure easily reached by the method previously described.

The presence in the stems and leaves of infected Phloxes of a polyphagous species of eelworm, viz. *Cephalobus subelongatus* Cobb, has already been recorded by STEINER.* We have found several adult and larval *Cephalobus* in herbaceous Phlox stems, for the determination of which I am indebted to Dr. T. GOODEY of the Institute of Agricultural Parasitology, St. Albans. It is a particularly easy eelworm to breed in culture, which suggests that it is a free-living species. Attempts to breed *Tylenchus dipsaci* in various media have always resulted in failure, and this has been found when attempting to breed *Aphelenchus* from Strawberry.† STEINER (*loc. cit.*) remarks that the inclination has been to disregard *C. subelongatus* as the cause of injury to plants, and suggests that more attention should be given to the ability of this eelworm to enter and live in healthy plants.

Biological Strains and Host Selection.

The practical importance to be derived from a study of the various biological strains of *T. dipsaci* is the discovery as to whether a particular strain is capable of attacking more than one of its usual host plants. At least sixty-eight host plants are recorded for this species.‡ The various strains are morphologically identical, and yet the parasitism of each strain is restricted.

We know that the strain which is highly specialized to *Phlox decussata* can directly attack with great virulence *P. Drummondii*, *P. divaricata*, and *Oenothera Fraseri*. The question as to the ease by which a particular strain of eelworm can transfer from one host to another depends entirely on the time during which the strain has

* *Jour. Agric. Research*, vol. xxviii, 1924, pp. 1059-1060.

† L. N. STANILAND, *Ann. Rept. Agric. and Hort. Res. Stat. Long Ashton*, 1925, p. 63.

‡ RITZEMA Bos, *Tijdschr. Plantenziekten*, Wageningen, vol. xxiii, 1917, pp. 99-135.

confined its attack to the original host. These various strains achieve a high degree of specialization.

The parasitic eelworm population of a soil may contain one, two, or more strains which may be either (i) monophagous, *i.e.* feeding on one host only—a condition liable to arise in herbaceous borders where the flora remains the same for many years; (ii) oligophagous, feeding on a restricted number of hosts; or (iii.) polyphagous, feeding on a great number of different host plants—a condition liable to arise in borders of annuals and the vegetable garden where an annual rotation of crops is the rule. The powers of adaptation to a new host will depend on the ancestral history of the strain.

The cultivator of plants who attempts to follow out the scientific principles of cultivation will keep a crop history of every part of his garden, so that danger from eelworm infection will be averted. To state a specific case, a border in which infected Phloxes have been grown for a number of years may be planted with Narcissus with a wide margin of safety without fear of infection from the Phlox strain, but always provided that the Narcissus strain is not introduced in or on the bulbs.

We have already drawn up * a list of varieties of herbaceous Phloxes which exhibit varying degrees of attractiveness to the stem eelworm. The factor is one of non-attraction rather than resistance to attack, the latter term implying an opposition to infection by some mechanical or chemical means. STEINER † remarks that the question of attraction and non-attraction to eelworm infection has little absolute value, for apparently any variety said to be only slightly affected may become highly affected should the eelworms have time to adapt themselves and to specialize on this particular host. Further work on the question of varietal non-attractiveness may result in a modification of STEINER'S statement. Amongst the comparatively few cases in which we can trace the origin of varieties, we find that susceptibility to eelworm attack is transmitted to the offspring in the case of seedlings and "sports" from infected parent plants.

Starvation tests using a highly specialized strain of *Tylenchus dipsaci* show that such a strain will starve and die out rather than accommodate itself to a fresh host. Dealing with a monophagous strain it might require generations before it can adapt itself to a new host, for, while the greater number will die, a few *may* survive and be able to accommodate themselves.

We have carried out at Wisley a series of "Starvation Tests" using a highly specialized strain obtained from herbaceous Phloxes. The strain used in the infection experiments had been in contact with herbaceous Phloxes for a period of at least six years before it was used. The weeds growing amongst the infected Phloxes were Sheep's Sorrel (*Rumex Acetosella*) and Horsetail (*Equisetum arvense*).

Greater success attended our efforts to induce cross-infection when pre-adult larval forms were used.

* G. FOX WILSON, *loc. cit. ante*.

† STEINER, *loc. cit. ante*.

We failed to infect *Gladiolus* with the Phlox strain. Mr. LEAK* has stated that "we have only had one bad loss of *Gladioli* by *Tylenchus* and that was not after the bulb (*Narcissus*) crop, but after a crop of Phlox." This statement might imply that the infection of the *Gladioli* was due to the Phlox strain, but without knowing the earlier crop history of the land, this conclusion is scarcely justifiable.

NYPELS† found that the following species of Phlox were not attacked by *Tylenchus dipsaci* in the vicinity of infected herbaceous Phloxes, viz. *P. divaricata*, *P. Drummondii*, *P. setacea* (*subulata*), and *P. verna*, and he was unable to infect *P. Drummondii* experimentally.

The following table shows the results of infection experiments which were started in 1923 with a view to discover the ease by which a highly specialized strain can accommodate itself to fresh host plants.

TABLE I.

Infection Experiments with Various Plants using a highly specialized Strain of Tylenchus dipsaci from Phlox decussata.

I. DICOTYLEDONS.					
N. O. <i>Ranunculaceae</i>	<i>Delphinium Ajacis</i>	.	.	1924-5	- *
N. O. <i>Cruciferae</i>	<i>Cheiranthus Allionii</i>	.	.	1924-5	-
N. O. <i>Caryophyllaceae</i>	<i>Dianthus barbatus</i>	.	.	1924-5	(+)
N. O. <i>Leguminosae</i>	<i>Trifolium incarnatum</i> , 2 vars.	.	.	1924-5	-
N. O. <i>Onagraceae</i>	<i>Oenothera Fraseri</i>	.	.	1927-8	+ +
	<i>O. F. Youngii</i>	.	.	1927-8	+ +
N. O. <i>Compositae</i>	<i>Solidago canadensis</i>	.	.	1924-5	(+)
	<i>Taraxacum officinale</i>	.	.	1924-5	-
N. O. <i>Campanulaceae</i>	<i>Campanula persicifolia</i>	.	.	1924-5	-
N. O. <i>Polemoniaceae</i>	<i>Phlox × Arendsii</i>	.	.	1928-9	-
	<i>P. decussata</i> , 301 vars.	.	.	1923-5	+ + + + +
	122 vars.	.	.	1923-5	+ + + +
	125 vars.	.	.	1923-5	+ + +
	49 vars.	.	.	1923-5	+ +
	28 vars.	.	.	1923-5	(+)
	<i>P. divaricata</i>	.	.	1928-9	+
	<i>P. Drummondii</i>	.	.	1924-9	+ + +
	<i>P. D. compacta</i>	.	.	1929	+
	<i>P. D. cuspidata</i>	.	.	1929	+
	<i>P. D. grandiflora</i>	.	.	1924-9	+ + +
	<i>P. pilosa</i>	.	.	1928-9	-
	<i>P. subulata</i> var.	.	.	1928-9	-
	<i>P. suffruticosa</i> , 2 vars.	.	.	1923-5	+ +
N. O. <i>Solanaceae</i>	<i>Schizanthus retusus</i> vars.	.	.	1924-5	(+)
	<i>S. wisetoniensis</i> vars.	.	.	1924-5	(+)
N. O. <i>Plantaginaceae</i>	<i>Plantago lanceolata</i>	.	.	1924-5	-
	<i>P. major</i>	.	.	1924-5	-
N. O. <i>Polygonaceae</i>	<i>Polygonum Persicaria</i>	.	.	1924-5	-
2. MONOCOTYLEDONS.					
N. O. <i>Iridaceae</i>	<i>Gladiolus large-flowered</i> vars.	.	.	1926-8	-
	<i>G. primulinus</i> vars.	.	.	1926-8	-
N. O. <i>Amaryllidaceae</i>	<i>Narcissus × Leedsii</i>	.	.	1924-6	-
	<i>N. poeticus</i> vars.	.	.	1924-6	-
	<i>N. p. ornatus</i>	.	.	1924-6	-
	<i>N. Pseudo-Narcissus</i> vars.	.	.	1924-6	-
N. O. <i>Liliaceae</i>	<i>Allium Cepa</i> , 2 vars.	.	.	1924-5	-
N. O. <i>Gramineae</i>	<i>Anthoxanthum odoratum</i>	.	.	1924-5	-

No infection, —. Degrees of infection, (+), +, + +.

* *R.H.S. Jour.*, 52, 1927, p. 66.

† *Annales Soc. Belge de Microscopie*, vol. xxiii. 1898, pp. 26-29.

The Spread of Infection.

In addition to the several ways, previously mentioned, by which eelworms are spread from place to place, two investigations were carried out at Wisley, and the results are herewith appended.

1. *The Effect of Soil on the Spread of Tylenchus dipsaci*.—A series of experiments was commenced in the spring of 1929 to ascertain the spread of the Stem Eelworm from an infected centre to neighbouring plants. A study of Table II will show the degree of infection reached in various types of soils kept under wet and dry conditions. The range was from a very rapid spread in moist loamy and sandy-clay soils to a comparatively slow progress in dry sandy and sandy-chalk soils. The eelworms can travel with greater ease in a watery medium between the soil particles. In light sandy soils progress is more difficult and the subsequent natural spread is slowed down to an almost negligible quantity.

TABLE II.

The Effect of Various Types of Soils on the Spread of Tylenchus dipsaci.

Four series of three pans (12 inches diameter) were used in this experiment, which was set up for the purpose of determining the spread of the Stem Eelworm in four types of soils under dry and wet conditions. The various soils and pans were steam-sterilized at 180° F. for 3 hours prior to seed-sowing.

May 30, 1929.—50 seeds of *Phlox Drummondii* sown in each pan.

June 6, 1929.—Seeds germinated.

June 14, 1929.—50 larval and adult *Tylenchus dipsaci*, obtained from the stems of *Phlox decussata*, were mixed with water and poured into the centre of two of the pans in each series, the third pan being kept as a control. One of the infected pans was kept wet, the other was kept dry.

Type of Soil and Treatment.	Number of Seeds germinated.	Number of Plants Infected by August 19.
1. Loam—turf only.		
Infected and dry	31	6
Infected and wet	36	8
Non-infected and normal moisture .	33	0
2. London clay, 50 per cent.		
Sand, 50 per cent.		
Infected and dry	30	3
Infected and wet	31	5
Non-infected and normal moisture .	27	0
3. Chalk, 50 per cent.		
Bagshot sand, 50 per cent.		
Infected and dry	28	0
Infected and wet	26	2
Non-infected	29	0
4. Wisley top-spit (Bagshot sand).		
Infected and dry	33	1
Infected and wet	25	3
Non-infected	27	0

2. *Transmission through the Alimentary Tract of a Rabbit*.—We have noticed in certain country gardens that the young shoots of herbaceous Phloxes are devoured with avidity by rabbits. It was unknown whether the stages of *Tylenchus dipsaci* could pass unharmed through the alimentary canal of these animals. If they could, another indirect method of dispersal would be open by which the pest could be disseminated from an infected to a non-infected garden.

Previous work along these lines has been carried out by LEUKEL * and MARCINOWSKI,† both of whom fed galls containing eggs and larvæ of *Tylenchus tritici* to various animals. LEUKEL remarks that the results seemed to indicate that the eelworms failed to survive passage through the alimentary tract of sparrows, chickens, cows, horses, sheep, and hogs. MARCINOWSKI fed galls to sparrows, goldfinches, pigeons, chickens, mice, gophers, and marmots and found some live larvæ in the fæces in all except those from chickens, gophers, and marmots, and states that birds are a minor factor in the dissemination of this species of eelworm.

The eelworm investigations were commenced in May 1925. A domestic rabbit was kept under hygienic conditions in a hutch and all possible precautions taken to ensure against possible eelworm contaminations from straw, etc.

May 15 to June 8.—Daily food consisting of well-washed cabbage and lettuce leaves, young broccoli "heads" and *Poa annua* from eelworm-free plants and "middlings."

June 8 to 11.—Food consisting entirely of heavily infected young shoots of herbaceous Phloxes. The fæces were collected daily and kept in sterilized glass jars.

Microscopic examinations of the fæces were made at intervals and no living eelworms were discovered. Disintegrated larval and adult eelworms and plasmolysed eggs were, however, seen.

A series of pot experiments was carried out during the summer, using eelworm-free herbaceous Phloxes and *Phlox Drummondii*.

Seed was sown in pans containing :

- (I) Sterilized soil + varying numbers of droppings, both whole and crushed.
- (II) Sterilized soil + minced eelworm-infected shoots of herbaceous Phloxes similar to those fed to the rabbit.

The results were that no infection was obtained in any pan in Series I, but heavy infection of both host plants was obtained in Series II, which suggests that *Tylenchus dipsaci* is unable to survive transit through the alimentary tract of a rabbit.

* *Jour. Agric. Research*, vol. xxvii. 1924, pp. 944-947.

† *Arb. K. Biol. Anst. Land- und Forstw.*, vol. vii. 1909, pp. 1-192.

Control Measures.

To avoid disease two things are necessary, viz. clean eelworm-free soil and clean healthy plants.

No practicable means of sterilizing soil for the purpose of killing parasitic eelworms in the open ground is yet known. Neither Phlox nor any other plant known to be attractive to the Phlox strain of the eelworm should be planted in infected soil for a period of at least four years after an outbreak has occurred.

The utmost care should be taken that soil is not transplanted from the infected part of the garden to fresh areas on garden tools and the boots of persons walking on the infected area.

All plants showing the least sign of infection (fig. 22) should be dug up in spring and destroyed. In lifting diseased plants, the operation must be carried out with thoroughness so that no part of the underground stem is left in the soil to carry on infection. An attempt is sometimes made to cut off those shoots showing the symptoms of the disease in the hope that the plant may be saved. This is a dangerous practice, for though the other shoots may themselves appear healthy, the chance of saving an infected plant is small.

Propagation by :

(i) Seed.—The occurrence of *Tylenchus dipsaci* in the seeds of certain composites has been recorded by GODFREY.* We have never discovered eelworms in the seed saved from heavily infected plants of any annual or perennial species of Phlox. Seed collected from plants growing in infected soil should be sown in steam-sterilized soil (180° F. for 3 hours) and the subsequent plants placed in eelworm-free soil.

(ii) Stem Cuttings.—Failure to raise clean stock will result if stem cuttings are obtained from infected plants. Cuttings obtained from healthy plants in soil free from eelworms will be safe.

(iii) Division.—Division of diseased plants is sure to result in diseased progeny.

(iv) Root Cuttings.—The raising of clean plants from infected plants by means of root cuttings is certain so long as the roots are washed completely from the soil surrounding them and placed in clean soil. Fig. 23 shows a pot of healthy plants on March 1, 1926, raised from root cuttings of diseased plants placed in clean soil in mid-January.

TABLE III.

Condition of a Collection of Phlox decussata plants in Experimental Plots at Wisley in 1927.

During the autumn of 1926, four plots were planted with 243 varieties of *Phlox decussata* in series of three plants, each series comprising (i) the parent plant obtained from the original Phlox border ;

* *Jour. Agric. Research*, vol. xxviii. 1924, pp. 473-478.

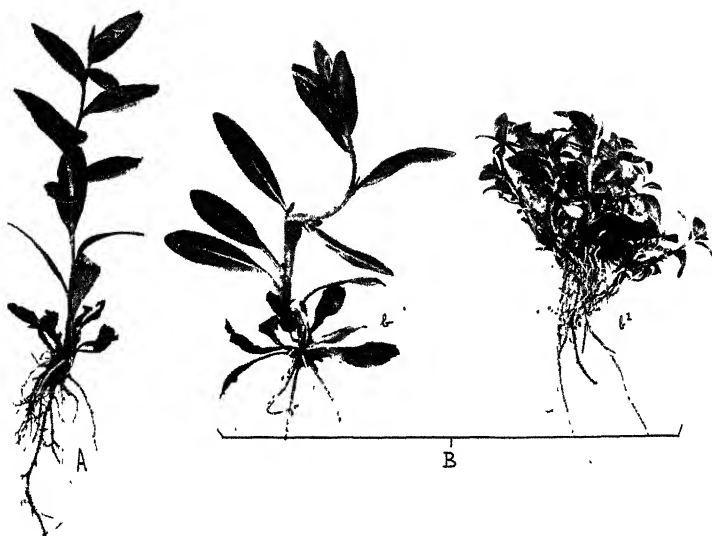


FIG. 20.—*OENOTHERA FRASERI* :
 A, Healthy plant ; B, Artificially Infected plants showing *b*, angled growth ;
*b*¹, proliferation of basal buds.

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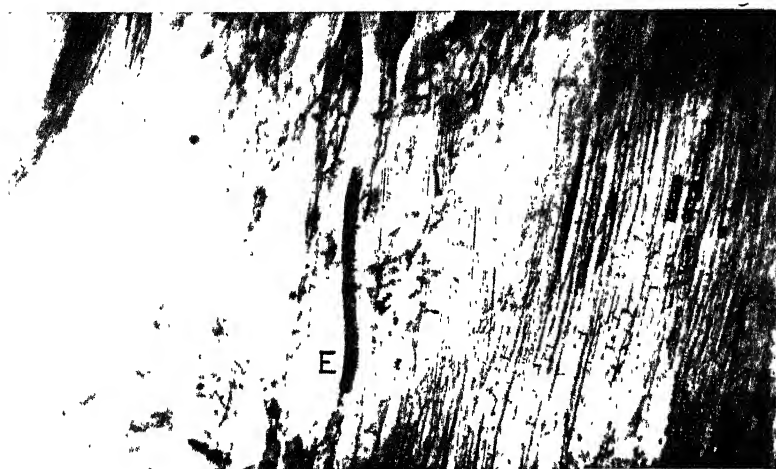


FIG. 21.—FELWORM (E), *Tylenchus dipsaci*, IN CORTICAL CELLS
OF HERBACEOUS PHLOX.



FIG. 22.—HERBACEOUS PHLOX PLANT SHOWING EARLY SYMPTOM OF ATTACK BY STEM EELWORM.



FIG. 23.—HEALTHY PHLOX PLANTS RAISED FROM ROOT CUTTINGS TAKEN
FROM A DISEASED PLANT.

[To face p. 97.

(ii) a stem cutting, and (iii) a root cutting, both obtained from the parent plant and propagated during the spring of 1926. The following table indicates the condition of the plants during the summer of 1927 :

	Healthy. %	Poor Growth. %	Dead. %	Infected with Eelworm. %
Parent plants . . .	84.36	2.05	2.88	10.71
Stem cuttings . . .	73.64	8.63	9.46	8.27
Root cuttings . . .	91.44	5.35	3.21	—

Cultural Methods.—Infected shoots should be removed in early spring and burnt. When the dead flowering stems are cut in the autumn (the shoots on diseased plants die down earlier than those on healthy plants) an effort should be made to cut them low down at soil level in order to leave as little as possible of the dead stem so that the chances for the dried-up eelworms to become lodged are reduced. All diseased stems should be burnt and not placed on the rubbish heap unless means are used to raise the temperature by dressing the heap at intervals with sulphate of ammonia, which encourages bacterial activity so that the temperature is raised to at least 120° F.

Slightly affected plants should receive a heavy mulch of clean leaf-mould and old potting soil in early spring to prevent check to growth at this season. The effect of frosts and cold winds at the early stages of growth is to check the plants but not the eelworms within them, and the combined effects of unfavourable weather and eelworm infection will cripple them beyond hope of saving them.

Rotation of Crops.—Before planting Phlox it is necessary to know the crop and weed history of the land over a period of years. This information will provide some guide as to the probable eelworm population of the soil and the chance which a fresh host may have when placed in infected ground. One may even plant on infected land crops which are themselves attractive to *Tylenchus dipsaci* but are not attractive to the particular strain present in the soil.

We know from the results set out in Table I that it is fatal to plant the following in a border containing the herbaceous Phlox strain of eelworms, viz. Sweet William, *Schizanthus*, *Solidago canadensis*, *Oenothera Fraseri* and its variety *Youngii*, *Phlox Drummondii* and its varieties, *P. divaricata*, and *P. suffruticosa*. The ideal method of eradicating eelworms from soil is to starve out the pest by allowing the ground to remain fallow and free from weeds for two or three years, but this is impracticable in gardens. The most satisfactory practicable method is to follow on an infected crop with one that is not attractive to the eelworm.

Trap Crops.—The use of a trap crop is a satisfactory method of ridding infected soil of eelworms provided that the choice of plant is based upon a knowledge of the host history of the particular strain which it is intended to eradicate. For this method to be effective the crop used must be cheap, quick-growing, and readily susceptible to attack by the strain of eelworm present.

The sowing of *Phlox Drummondii* on borders infected with the herbaceous Phlox strain will tend to rid the soil of the eelworms or,

at least, lessen their numbers. Three sowings may be made in one year, each crop being removed completely and burnt as soon as the plants exhibit symptoms of attack.

Manurial Treatment of Infected Soil.—That there is danger from introducing eelworms into gardens in manure and other decaying organic matter cannot be disputed.

The aim should be to supply infected plants with fertilizers calculated to stimulate healthy growth and help them to tide over the period of checked growth and lowered vitality. It is too early to make a definite statement as to the effects of various fertilizers on the incidence of attack, but a series of plots at Wisley containing heavily infected plants show that those which are growing in land dressed annually with (i) sulphate of potash at the rate of 3 cwt. to the acre, and (ii) a mixture of sulphate of potash and sulphate of ammonia, at the rates of 3 cwt. and 1 cwt. respectively to the acre, are more luxurious and able to withstand attack better than those on the Control Plots and on the plots dressed with potash manures at a lower rate and iron sulphate. The beneficial effect of potash on infected plants is not only nutritional but induces greater rigidity, cell turgidity and fibrous rooting. STEINER* suggests that the value of this fertilizer points towards a certain neutralization of the toxic influence of the parasite. RAMSBOTTOM† states as a result of manurial treatment of infected ground that the fertilizers and combinations of fertilizers used in field experiments cannot be depended upon to support the *Narcissus* against infection by eelworm.

Hot Water Treatment of Plants.—The treatment of infected *Phlox* plants by immersing them in hot water is based upon RAMSBOTTOM's successful control of the *Narcissus* eelworm by this method.‡

Table IV sets out the results obtained by subjecting *Phlox* plants during the dormant season to water at varying temperatures and for varying periods of time. Immersion of infected plants for from 1 to 3 hours at a temperature of 113° F. killed all eelworms and their eggs, but the effect on the plants was often fatal. Satisfactory control was obtained by immersion for 2 to 3 hours in water at 110° F. Some of the treated plants subjected to this temperature (110° F.) died, but this was due to the abnormally high infection of those plants; they would have succumbed even without treatment. One hour's immersion at 110° F. was insufficient to allow the heat to penetrate into the thick underground stems.

TABLE IV.

Hot Water Treatment of Phlox Plants.

Normal-sized plants of *Phlox decussata*, heavily infected with *Tylenchus dipsaci*, were subjected to varying temperatures and times of exposure by means of a Hearson's Bulb Bath. After treatment,

* STEINER, *loc. cit. ante*.

† R.H.S. Jour., 44, 1919, pp. 69-70.

‡ *Ibid.*, 43, 1918, pp. 65-78.

the plants were dried and potted into steam, sterilized soil in 8-inch pots. Notes were taken as to the condition of the plants and the degree of infection over a period of 3 years following treatment.

1924 Experiments.

Variety.	Date of Treatment.	Temp. of Water.	Time of Exposure.	Condition * of Plant.	Belworm † Infection.
Arthur Ranc	Jan. 24	104° F.	1 hour	H.	(+)
Baccile	"	"	"	F.H.	+ +
Iris	"	"	"	V.H.	—
Rijnstroom	"	"	"	V.H.	+
Antonin Mercié	Jan. 25	104° F.	2 hours	Dead	
Rijnstroom	"	"	"	F.H.	+ + +
Sir David Beatty	"	"	"	F.H.	+ + +
Crépuscule	Jan. 25	104° F.	3 hours	H.	(+)
Derviche	"	"	"	P.	—
Freifräulein von Lassberg .	"	"	"	P.	—
Rijnstroom	"	"	"	V.H.	+
Antonin Mercié	Jan. 25	113° F.	1 hour	Dead	
Le Mahdi	"	"	"	P.	—
Marvel	"	"	"	P.	—
Rijnstroom	"	"	"	P.	—
E. Boissier	Jan. 25	113° F.	2 hours	P.	—
Francillon	"	"	"	P.	—
Marchioness de Tullibardine	"	"	"	V.P.	—
Rijnstroom	"	"	"	V.P.	—
A. J. MacSelf	Jan. 30	113° F.	3 hours	P.	—
Rijnstroom	"	"	"	Dead	
Rose Queen	"	"	"	P.	—
Theresa	"	"	"	P.	—
Goliath	Jan. 30	100° F.	1 hour	H.	(+)
Lumineau	"	"	"	H.	+
Mrs. Oliver	"	"	"	H.	+
Embracement	Feb. 1	100° F.	2 hours	H.	(+)
Francillon	"	"	"	H.	+
Printemps	"	"	"	P.	—
Iris	Feb. 4	100° F.	3 hours	H.	—
Liberté { small }	"	"	"	H.	—
Rijnstroom { plants } . . .	"	"	"	H.	—
Frau Antonin Buchner . .	Feb. 5	95° F.	1 hour	H.	—
Rijnstroom	"	"	"	H.	+
Rijnstroom	"	"	"	H.	—
Rijnstroom	Feb. 5	95° F.	2 hours	V.H.	—
Rijnstroom	"	"	"	V.H.	+
Le Mahdi { small }	Feb. 6	95° F.	3 hours	H.	—
Le Mahdi { plants } . . .	"	"	"	H.	—
Le Mahdi	"	"	"	H.	—
Dr. Charcot	Feb. 6	86° F.	1 hour	V.H.	+ +
Tristan Bernard	"	"	"	H.	(+)
Dr. Charcot	Feb. 6	86° F.	2 hours	V.H.	—
Emmanuel de Rouge { small } .	"	"	"	H.	—
Emmanuel de Rouge { plants } .	"	"	"	V.H.	+
Aegir	Feb. 8	86° F.	3 hours	V.H.	(+)
Aegir	"	"	"	V.H.	(+)
Francillon	Control	—	—	P.	+ +
Lady Tate	"	—	—	H.	+
Magician	"	—	—	V.H.	+
Marie S. Jacobs	"	—	—	P.	+
Baron von Dedem	"	—	—	V.H.	+
Leonie Cobb	"	—	—	P.	—
Rijnstroom	"	—	—	H.	+ +

* H. = healthy. F.H. = fairly healthy. V.H. = very healthy. P. = poor. V.P. = very poor.

† No infection, —. Degrees of infection, (+), +, + +.

1925 Experiments.

Variety.	Date of Treatment.	Temp. of Water.	Time of Exposure.	Condition * of Plant.	Helworm † Infection.
Australia	Jan. 15	110° F.	½ hour	H.	+
Gloire de Maroc . .	"	"	"	H.	+
Mrs. Grenander . .	"	"	"	H.	—
Seedling	"	"	"	H.	(+)
Duguesclin	Jan. 15	110° F.	1 hour	H.	+
Emmanuel de Rouge .	"	"	"	H.	—
Francillon	"	"	"	H.	+
Geoffrey St. Hilaire .	"	"	"	H.	(+)
Sheriff Ivory	Jan. 16	110° F.	1½ hour	V.H.	(+)
Seedling	"	"	"	Dead	—
Seedling	"	"	"	Dead	—
Baron von Huckeren .	Jan. 16	110° F.	2 hours	H.	—
Nicholas Flammel . .	"	"	"	Dead	—
Nicholas Flammel . .	"	"	"	H.	—
W. Robertson	"	"	"	Dead	—
Baron von Dedem . .	Jan. 16	110° F.	3 hours	H.	—
Mrs. Forbes	"	"	"	Dead	—
Rijnstroom	"	"	"	H.	—
Seedling	"	"	"	F.H.	—
Baron von Dedem . .	Control	—	—	H.	++
Eclairer	"	—	—	P.	+++
Geoffrey St. Hilaire .	"	—	—	H.	—
Mrs. Grenander . . .	"	—	—	Dead	—
Rijnstroom	"	—	—	H.	+
Sheriff Ivory	"	—	—	H.	+
Seedling	"	—	—	H.	—

* H. = healthy. F.H. = fairly healthy. V.H. = very healthy. P. = poor.

† No infection, —. Degrees of infection, (+), +, ++.

I wish to acknowledge my thanks to Mr. F. C. BROWN and Mr. N. K. GOULD, both of Wisley, for the photographs illustrating this paper.

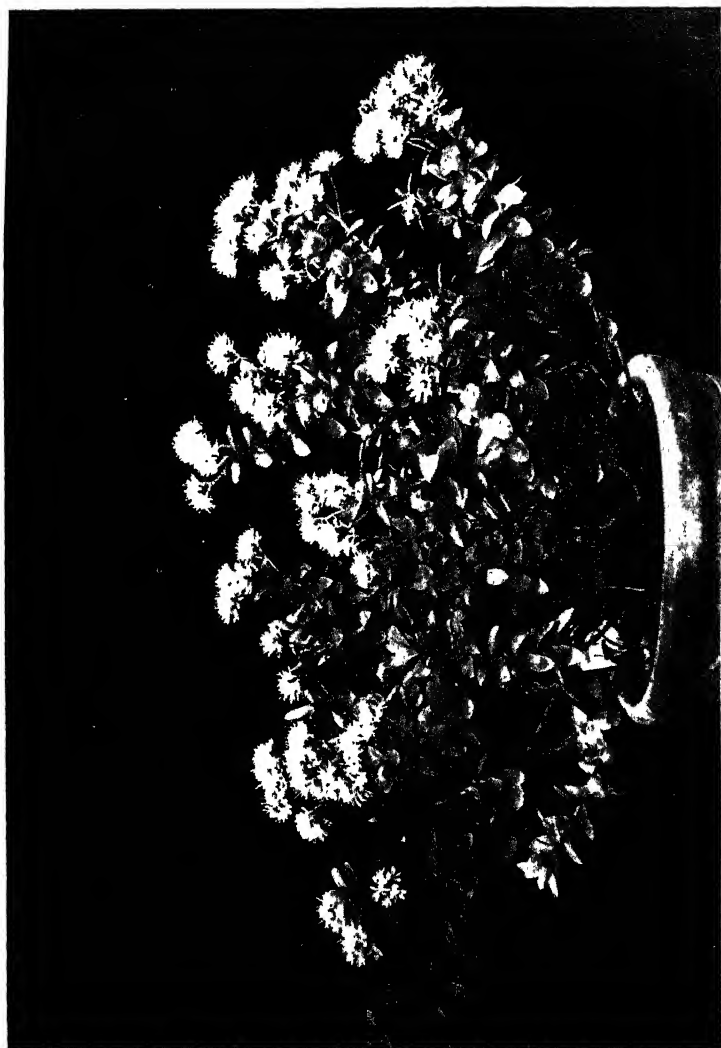


FIG. 24.—*HEBE ALLANII*.
Leaves hairy. Hardy dwarf shrub.

[To face p. 100

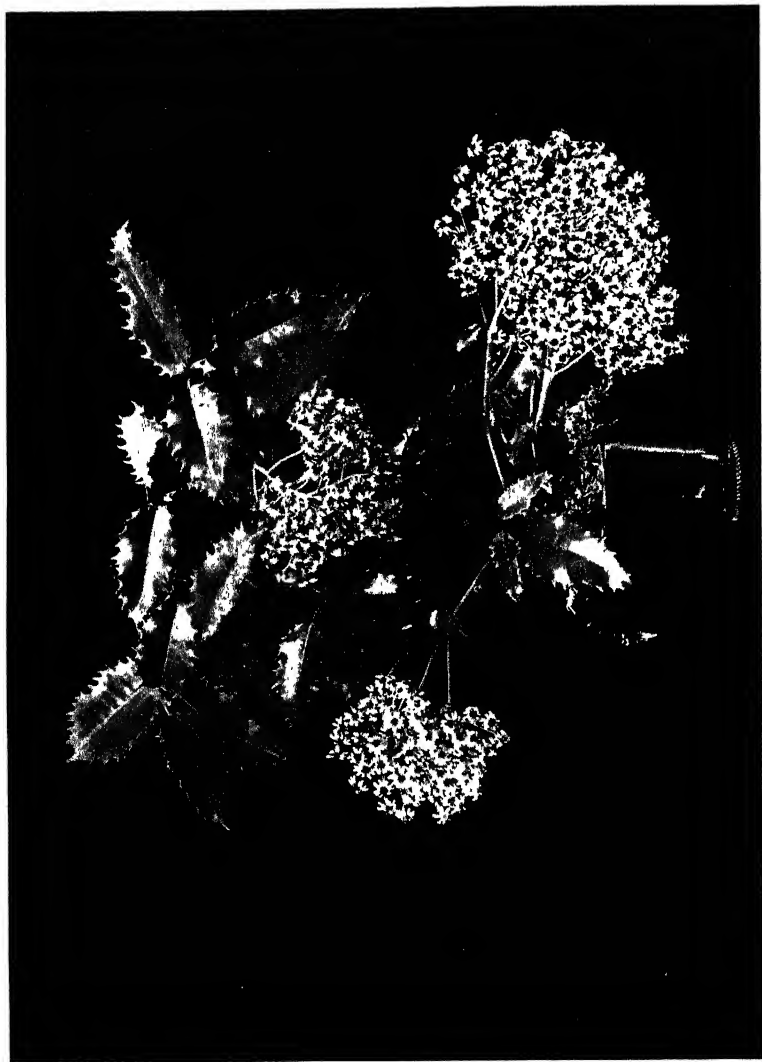


FIG. 25.—*OLEARIA MACRODONTA*.
Shrub.

NEW ZEALAND PLANTS AND THEIR DIFFICULTIES.

By Dr. A. H. WILLIAMS.

[Read June 25, 1929; Mr. J. CHEAL, V.M.H., in the Chair.]

I FEEL that I am somewhat presumptuous in daring to deal with such a subject as this, when we number among the members of our Society men like Major DORRIEN-SMITH, the Rev. A. BOSCAWEN and our President, who have had far greater experience than I in growing New Zealand plants. But having spent nearly twenty years in New Zealand, and a good deal of that in the company of my late father, Bishop W. L. WILLIAMS, who was an accurate observer of the plants of our native land, I have always been modestly enthusiastic about their culture here; though, till recently, I had but small opportunity of actively carrying this out.

In order to account for the admitted difficulty in growing many of the New Zealand plants in this country, I propose first to touch on the remote history of those islands; for it is strange and truly unique. Then I will give some account of the meteorological and physical conditions there as compared with those of Britain.

REMOTE HISTORY OF NEW ZEALAND.

It is now conceded that, in a dim, distant geological era, the land that we now know as New Zealand formed part of a vast continent. This extended far to northern and north-western tropical regions, including New Guinea and the eastern half of Australia. At that time the western part of Australia was separated from the eastern portion by a wide arm of the sea. Southwards this continent extended down to the Antarctic region and was probably in this way connected with the southern part of South America.

In the Eocene Age a crumpling of the earth's surface resulted in the greater part of this continent becoming submerged. Eastern and Western Australia became united. And New Zealand was left in a state of splendid isolation, which it was to maintain, through many thousands of years, till comparatively recent times.

At the time of this isolation the development of the fauna of the world had not passed beyond the stage of reptiles and birds. New Zealand was therefore left with a fairly extensive flora, but a very, very restricted fauna. There were insects of many kinds; birds of many kinds; fish and crustaceans in the waters; a few varieties of lizard; one species of frog; and one species of a lizard-like creature called the Tuatara, which is supposed to be the sole surviving representative of prehistoric reptilian monsters. Of snakes there were fortunately none; and of mammals also there were none. It is

difficult to picture the conditions of a very fertile land, with a most genial climate, existing for many thousands of years without the presence of man or any other mammal.

Not until somewhere about the twelfth century A.D. did man make his first appearance in New Zealand. For at a time considerably later than the filibustering expedition of WILLIAM OF NORMANDY to England, an intrepid Maori mariner set out on a voyage of discovery. Some thousands of miles to the south of his home in Hawaiki he found this pleasant and fertile land, teeming with bird life and with shoals of fish in its waters; but with no human beings to make use of this profusion.

He succeeded in returning to his native land with the report of his discoveries. A generation or two later it was decided to make an expedition in force, with the object of peopling this uninhabited southern Utopia. A large party of Maoris, therefore, set out with their wives and families and what stores they could carry, in a fleet of twelve ships. These ships consisted of nothing more elaborate than twin canoes—each canoe being hacked out of a single tree trunk. Each pair of canoes would be connected by a rough deck, on which the only shelter would be small deck-houses thatched with rushes. When one thinks of these brown uncivilized mariners deliberately setting out on a voyage of thousands of miles, over a turbulent ocean, in such primitive vessels as these, the exploits of CHRISTOPHER COLUMBUS and of our own early explorers seem puny performances by comparison.

With these early voyagers came a species of black rat and a small bat, to be the first wild mammals to inhabit these islands. They possibly came as stowaways hidden in the thatch of the deck-houses. This rat was a mild-mannered gentleman compared with our own brown Norway friend. The latter, since his introduction to New Zealand, has almost, if not quite, exterminated his black predecessor.

From the time of this colonization by the Maoris up to the visit of Captain Cook, about 150 years ago, there would be little change in the fauna and flora of New Zealand, except for the extermination by the Maoris of some of the strange flightless birds, like the giant Moa.

THE FLORA OF NEW ZEALAND.

From this brief outline of what had been going on in this part of the world in prehistoric times, it is natural to expect that the flora of New Zealand would be very dissimilar to that of any other country. For here is a land which originally collected its vegetation from a large continent extending from the tropics to the Antarctic. For many ages it had been cut off from any communication with other parts of the terrestrial globe. Through these countless centuries the plants growing there, whether of tropical or of temperate origin, have been allowed to work out their own development as best to suit the conditions in which they found themselves. During this long period their

characters would not be varied by the introduction of fresh species from other parts. They had not to contend with gross destruction that might have been caused by human agency or by herbivorous mammals. In their struggle for life they would only have to contend with the interference of birds and insects ; with overcrowding from their companion species ; and with the vagaries of a climate admittedly genial.

One can well imagine the ecstasy of the erudite botanists who accompanied Captain COOK, and of their earlier followers, in being able, for the first time since botany had become a science, to work out and classify a truly virgin flora in a new and isolated country. The few plants that had been introduced by the Maoris, for purposes of food, were easily recognized and did not confuse the issue.

How unique is this flora, may be gathered from the fact that of the 1,700 to 1,800 species indigenous to New Zealand no fewer than 75·4 per cent. are found in New Zealand alone.

Of the comparatively small remainder that are not confined to New Zealand alone, 339 species are also found in Australia only ; 82 species are also found in South America only ; and 30 species are found in New Zealand, Australia and South America, but nowhere else.

The relationship between the flora of New Zealand and that of Australia is easy to understand ; for Australia, though distant 1,000 miles, is, with the exception of small islands, New Zealand's nearest neighbour. But the curious point about this connexion is that the plants which are common to these two countries do not include any of those species which are usually considered to be characteristically Australian, such as *Eucalyptus*, *Mimosa*, etc. It is not that New Zealand does not suit them ; for, since they have been introduced there, they are apt to increase so rapidly as to become a nuisance. The theory put forward to explain this paradox is that, at the time, in dim, distant ages past, when there was land connexion between Eastern Australia and what is now New Zealand, these characteristically Australian plants were confined to Western Australia, then separated by sea from Eastern Australia ; and that these plants did not spread to Eastern Australia till after the Eocene upheaval which united the two parts of that continent, but which at the same time cut off New Zealand by many miles of ocean.

For the explanation of the remarkable relationship between the floras of New Zealand and South America we must again have recourse to the theory of the pre-Eocene continent which gave a land connexion between these two countries. For it is impossible to believe that germinable seeds could have been carried across the many thousands of miles now intervening.

Amongst the peculiarities of the New Zealand flora I would mention the following :

The tropical appearance of the forests in a temperate region ; the rarity of deciduous trees ; trees of very slow growth ; trees with dull and unobtrusive flowers ; trees and shrubs very commonly dioecious ;

trees with long-persisting juvenile forms ; tangled undergrowth with lianes of many species ; the prevalence of epiphytes and filmy ferns. Then outside the forests we have such things as tree-like speedwells ; speedwells closely resembling cyprus ; the lily liane (*Rhipogonum scandens*) or supple-jack ; the palm lily (*Corádyline*) ; the giant buttercups (*R. Lyallii* and *R. insignis*) ; the shrubby daisies (*Olearia*) ; the woolly-leaved daisy (*Pachystegia insignis*) ; the shrubby groundsels (*Senecio*) ; the giant forget-me-not (*Myosolidium hortense*) ; forget-me-nots that are seldom blue ; gentians that are never blue ; calceolarias that are white ; curious cushion plants (vegetable sheep, *Raoulia* and *Haastia*) ; palm-like tree ferns ; ferns that climb ; plants of many kinds with curiously thick and heavily tomentosed leaves ; and so on. How one would revel in growing many of these curious or beautiful plants, so different from our old garden favourites, if only they would take a little more kindly to our British climate !

At Tresco, in the Isles of Scilly, Major DORRIEN-SMITH has for many years been successfully cultivating a very large proportion of the species in the New Zealand flora. There many of them, particularly those from the coastal areas, flourish every bit as well as in their native land. Similar conditions may be found in the Channel Islands and in the more genial parts of Devon and Cornwall. In certain other gardens, too, in other southern counties, notably in that of our President, fine collections of New Zealand trees, shrubs, and other plants may be found. Many of these, however, suffered severely during the last two winters. But it is not very long since the number of gardens in England in which one would find any New Zealand plants, beyond such things as a few Veronicas and an occasional *Olearia*, was very limited.

In the last few years, however, there has been a very marked increase in the popularity of the cult of New Zealand plants. This change in the horticultural taste of England has been largely due to the recognition of the value of many of the New Zealand alpine as beautiful and hardy adjuncts to the rock garden. For the stimulation of a general interest in the flora of New Zealand the greatest personal credit is due to Dr. COCKAYNE, the New Zealand botanist. He has been indefatigable in his endeavours to induce gardeners, primarily in New Zealand, to recognize the beauty and value of many of their native plants, especially their alpine. His little book on "The Cultivation of New Zealand Plants," though written specially for gardeners in that country, is invaluable as a help to any one in England who is interested in the subject. It gives detailed information of habitat and characters, with instructions for culture and propagation of all the species that are worth growing.

CLIMATE.

New Zealand is popularly supposed to have a climate somewhat like our own, but a little better and more genial in most respects. One would naturally suppose, therefore, that any of the plants that

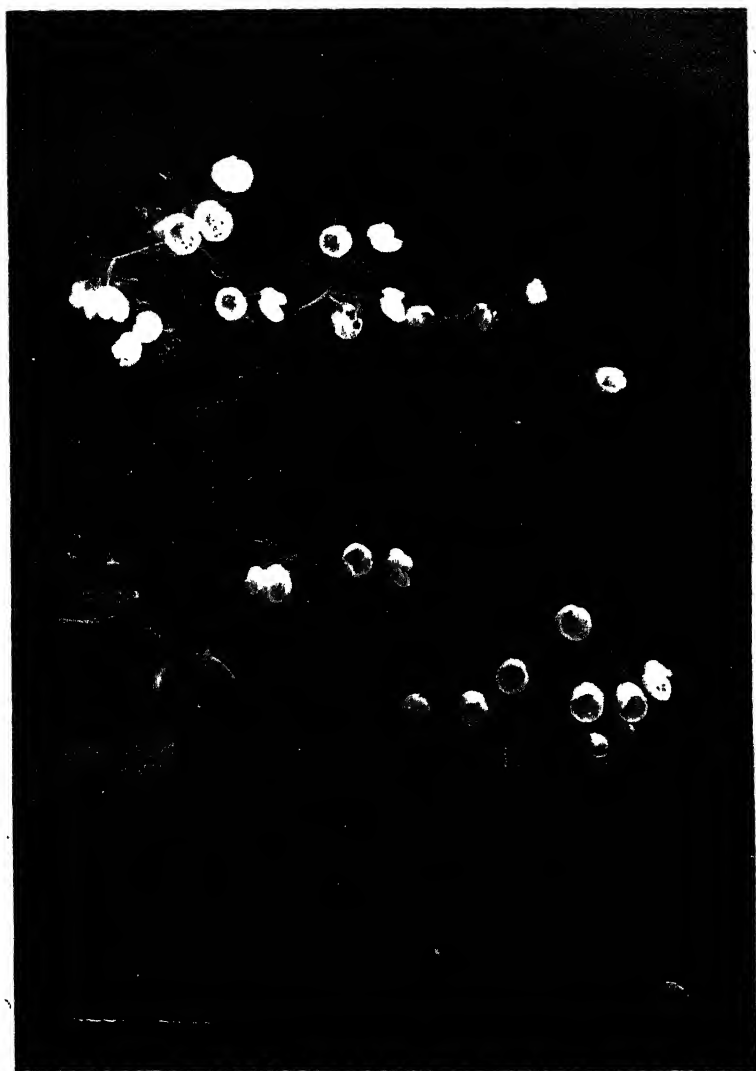


FIG. 26.—*CALCEOLARIA SINCLAIRI*.
A plant for a cool house.

[To face p. 104.



FIG. 27.—*ARTHROPODIUM CIRRHATUM*.
A plant for a cool house.



FIG. 28.—*FUCHSIA PROCUMBENS*.
A plant for a cool house, but hardy at times.

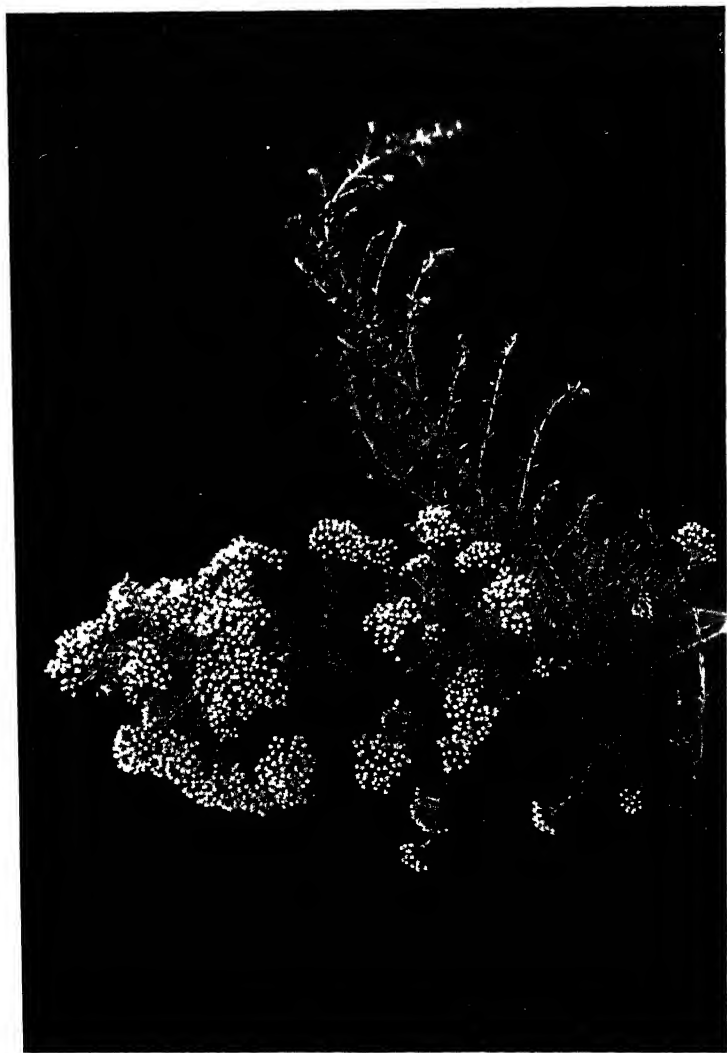


FIG. 29.—*CASSINIA VAUVILLIERSII*.
Hardy shrub.

[To face p. 105.]

flourish, at any rate in the southern and colder parts of those islands, would be reasonably hardy in most parts of this country. Unfortunately, this does not prove to be the case; for, after any winter other than mild, one must expect a heavy list of damage amongst our New Zealand plants. Even such a thing as the common Manuka (*Leptospermum scoparium*), which is such a nuisance to many farmers even in South Canterbury and Otago, cannot be trusted to survive a moderately severe winter in many gardens in southern England.

In order to find some reason for this disappointing fact I propose to give a short account of the climate of New Zealand as compared with that of Britain.

The word "climate" originally meant the inclination of a particular piece of the earth's surface to the sun; in other words, latitude. Fortunately for us in Britain there are other factors which are almost if not quite as important as latitude in determining what we now mean by climate. If this were not so we could not here expect to enjoy anything more genial than the climate of Labrador. And where then would be our beautiful gardens?

GEOGRAPHICAL FACTORS.

The growth of plants in any land is chiefly influenced by the conditions there as to temperature, rainfall and sunshine; and these in their turn are dependent on such geographical factors as the following:

1. Latitude.
2. Relationship to the ocean.
3. Prevailing currents in that ocean.
4. Prevailing winds.
5. Physical character of the land (altitude, etc.).

I will start my comparison under these headings.

1. *Latitude and Geographical Position.*

New Zealand consists of a group of islands closely comparable in total area with Great Britain. I used to be taught, as a boy, that New Zealand is a little larger than Great Britain, but a little smaller than Great Britain and Ireland.

New Zealand is often referred to as the Antipodes. This is not strictly correct. For if the exact antipode of New Zealand were plotted out in the Northern Hemisphere (fig. 30) it would be found that the southernmost point of Stewart Island would lie at a point in the Atlantic about 400 miles due west of the mouth of the Loire and 350 miles south-west of Land's End; whilst the North Cape of the North Island would fall on the coast of Morocco, a short distance west of Fez. The greater part of New Zealand would lie across Spain. This places New Zealand in general about 1,000 miles nearer to the Equator than Britain; were it not for other factors there could be little similarity between the climates of the two countries.

2. Relationship to the Ocean.

Both countries are alike in being insular. But the insularity of Britain is to some extent modified by its close proximity to the continent of Europe. New Zealand, on the other hand, is separated from

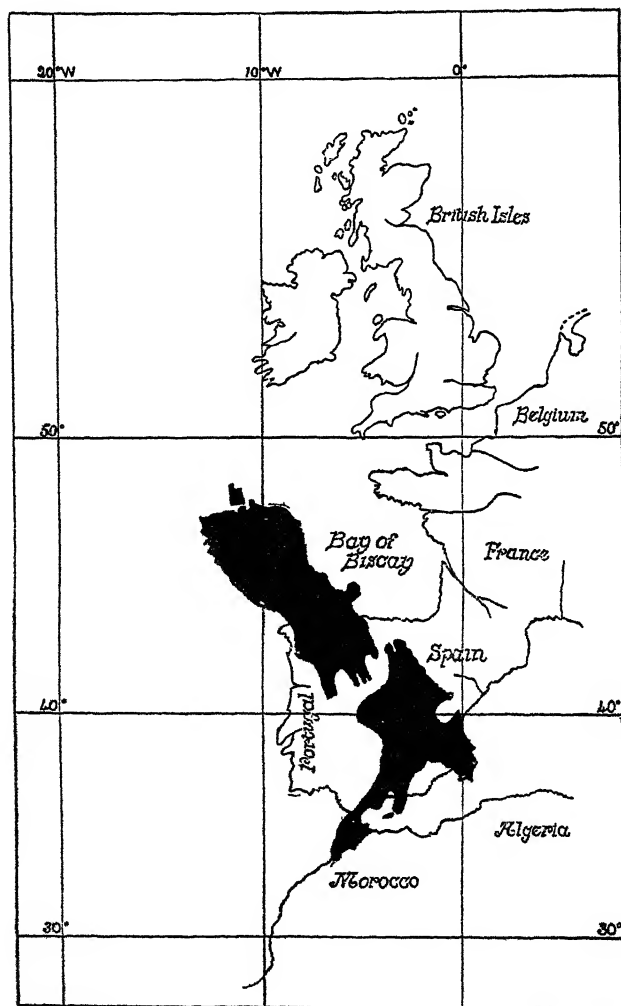


FIG. 30.—NEW ZEALAND IN ANTIPODE.
Western Europe in outline. New Zealand in black.

its nearest continent by 1,000 miles of ocean. This tends to give New Zealand greater equability of temperature than Britain.

3. Prevailing Ocean Currents.

For New Zealand the chief prevailing current is from the west and south-west. The extreme north of Auckland is influenced by a warm

current passing southwards between it and Australia. But the effect of this warm current on the rest of New Zealand is nullified by the main cold south-westerly current coming from the direction of the Polar regions.

With Britain, on the other hand, the prevailing current is a warm one, known as the Gulf Stream. This has such a marked influence on our climate that it brings England, as it were, 500 miles or so nearer to the Equator than its geographical position. And it is along the west coast of Britain that the influence of this current is most strongly felt.

To emphasize the effects of these ocean currents I may say that the limit of floating polar ice comes as near to the south of New Zealand as it does to the north of Scotland. The last time I left New Zealand we encountered a number of icebergs when only two days out from Wellington on the way to Cape Horn ; and this was in midsummer.

4. *Prevailing Winds.*

In both countries the prevailing winds come from the west. But those reaching Britain are likely to have been comparatively better warmed, after passing over many miles of the Gulf Stream. On the other hand, Britain often experiences, in the spring and early summer, long spells of wind from the north-east—wind that is chilled and biting after its passage over the cold territories of Northern Europe and Siberia. We all know too well the effects of these cold north-east winds on ourselves and on our plants.

New Zealand has no adjacent cold territory by which her secondary winds may be chilled. All her winds are ocean winds and therefore the more likely to be equable in temperature.

5. *Physical Characteristics.*

Under this heading we find a very marked contrast between the two countries.

Great Britain is mainly a country of low altitudes. Of England only a very small proportion reaches the height of 600 feet. Even in Scotland and Wales at least half their area must lie below 1,000 feet. The highest mountain in Britain does not reach 4,500 feet. Perpetual snow and ice are unknown in the country.

New Zealand, on the contrary, is a land of high altitudes. Quite a small proportion of the whole country lies at a lower level than 600 feet. The largest area of this low-lying land is that part of the Auckland Province which lies to the north of latitude 38°. Other considerable tracts of low land are found between Palmerston and Wanganui in the North Island, and in Canterbury and south-east Otago in the South Island. Outside these areas the land below 600 feet is chiefly confined to narrow strips along the coasts or running between the ranges of hills. Nearly two-thirds of the whole country must lie

above the level of 1,500 feet; and in few places could one travel 20 miles from the sea without reaching that height.

Extensive mountain ranges cover a great part of the South and run through the body of the North Island. Amongst these mountains there are 230 peaks exceeding 7,000 feet, and of these sixteen reach to over 10,000 feet, including Mount Cook at 12,350 feet, and there are large fields of perpetual snow and glacial ice. This is a very different story from that of Great Britain.

THE CLIMATE OF NEW ZEALAND.

To give a comprehensive description of the climate of New Zealand as a whole is as impossible as it would be to do so for Great Britain. What description could one give of a climate that would apply equally to Torquay on the one hand and to Braemar or even to Buxton on the other? For our purpose we must divide New Zealand into such areas that the climatic conditions in each will be more or less uniform. The two main groups of these areas will be Littoral and Inland. And here the marked difference in altitudes of the inland parts of New Zealand and of Britain will give very different conditions in those parts of the two countries.

First I propose to give some general details of the conditions in the littoral areas, and then a tabular comparison of the chief features in each.

Littoral Areas.

Area A: that part of the province of Auckland which lies to the north of latitude 38°—from Opotiki in the Bay of Plenty to Kawhia on the west coast. This gives an extensive piece of country about 300 miles from north to south, with its greatest width, about 100 miles, at its southern end. It is almost entirely land of low altitude, and is much intersected by arms of the sea. It is the part of New Zealand chiefly influenced by the warmer northern ocean current.

Its climate is sub-tropical and equable and almost entirely free from frost. This district, besides giving us the Kauri pine, is the home of many beautiful plants such as the Pohutukawa (*Metrosideros tomentosa*), the Whau (*Entelea arborescens*), Rewarewa (*Knightia excelsa*), Toropapa (*Alseuosmia macrophylla*), Waiatua (*Rhabdotheramnus Solandri*), and *Hibiscus diversifolius* (fig. 31). Any plants whose natural distribution is confined to this area would have little chance of surviving in the open in any parts of this country other than the most favoured localities in the south-west. But many are well worth growing under glass.

Area B comprises the rest of the littoral of the North Island. With this must be included the small district round Nelson in the South Island, for the climatic records from this are almost identical with those of Napier.

Most of this area consists of a narrow strip of coastal land of low altitude. It differs from Area A in being somewhat cooler and less



FIG. 31.—*HIBISCUS DIVERSIFOLIUS*.
Grow in a cool house.



FIG. 32.—*ARUNDO CONSPICUA*.
Flowers two months earlier than Pampas Grass.

[To face p. 109.]

equable ; in having occasional light frosts ; in a considerable difference in rainfall between the east and west coasts ; and in having a much larger share of bright sunshine.

Area C is the narrow strip of coast-line on the west of the South Island. It has an equable climate, somewhat cooler generally than that of *Area B*. Its most distinctive feature is its excessive rainfall. The average, over many years, at Hokitika is 116.6 inches per annum. But, in spite of this, it enjoys on the average 1,944 hours of bright sunshine in the year.

Area D.—The littoral on the east of the South Island (including the Canterbury Plains) has a light rainfall for New Zealand. It has a much greater range in extremes of temperature, summer and winter, than *Area C*. Frosts of several days' duration and down to 24° F. are not rare.

Area E is the south-east corner of the South Island, and includes Stewart Island. It gives us climatic conditions unlike anything found in other parts of New Zealand. The temperature generally is lower than in other areas, but fairly equable. It has a moderate rainfall for New Zealand. But it has a considerable experience of fog and over-cast sky. As a result we have poor sunshine records of only 1,641 hours for Dunedin and 1,568 hours for Invercargill. This gives a set of conditions as to temperature, rainfall, and hours of sunshine closely comparable with what is experienced at places like Plymouth and Southampton.

Table of Data for above Areas.

	A. Auckland, North.	B. Rest of North Island and Nelson.	C. South Island, West.	D. South Island, East.	E. South Island, South and South-East.
Frost	Rare	Occasional and light	Occasional	Not uncommon, often down to 24° F. and lasting for a few con- secutive days	
Average maximum for warmest month	74° F.	70°–75° F.	67.4° F.	72° F.	66.5° F.
Average minimum for coldest month	46° F.	37°–42° F. East. West.	36.7° F.	35.2° F.	34°–37° F.
Rainfall	45–50 in.	36 in.–60 in.	116.6 in.	25 in.	37–46 in.
No. of wet days per annum	150–185	107–189	186	123	159–190
Hours of bright sun- shine per annum .	2,000–1,950	2,481–2,022	1,944	2,087	1,641–1,568

The Inland Areas.

In the North Island, with comparatively small exceptions, the whole inland territory, from East Cape and Rotorua in the north to Mount Egmont in the west and Wellington in the south, is of high altitude, mainly over 1,000 feet above sea-level. It is traversed by considerable ranges of mountains, the highest point being reached by Mount Ruapehu at 9,175 feet.

Meteorological records for this area are scarce. But from those which I have been able to obtain I would estimate that the climate of the less elevated portions of this plateau is characterized by much greater extremes of temperature than the coastal districts. The shade temperature in the summer may be expected often to exceed 90° F., and, in the winter, frosts down to 26° F. would not be rare, whilst snow on the low hills is a common winter sight. The rainfall would be high, 40 to 55 inches in many parts; but less to the eastern side of the high mountains. The annual sunshine record would be well over 2,000 hours in most parts. The higher portions of the mountain ranges would give us true alpine conditions with very low temperatures in the winter.

In the South Island the inland area is even more mountainous, more rugged, and reaches higher altitudes than in the north. A very large proportion would be truly alpine, rather than merely montane.

The highest ridge of the mountains runs close to the west coast. And its effect is to bring about precipitation of most of the moisture with which the prevailing western wind is laden. As a consequence we have very heavy three-figure rainfall on the western slopes; but a very low rainfall in the country to the east of these first alpine ridges. Thus Tekapo in the Mackenzie country, a little to the east of Mount Cook, though barely 50 miles from the humid and equable west coast, gives us only 19 inches of rain, and records temperatures up to 86° F. in the summer and down to 4° F. in the winter; and, with this, the remarkable record of 2,742 hours of bright sunshine in the year. Similar conditions would probably be found in many other places in this inner part of the South Island.

Winds.

New Zealand is commonly described as an excessively windy place. Wellington, for instance, is boisterously gusty; for here the prevailing westerly winds endeavour to avoid going over the tops of the mountain ranges by dodging southwards, between the mountains of the two islands, through the gap at Cook Strait. One used to say that one could always recognize a Wellington man by the way he grabbed at his hat when approaching a street corner. But, taking New Zealand as a whole, I am doubtful of its being very much more windy than Britain. Think of the destructive gales so frequently experienced all round our own coasts. New Zealand would not give us much worse than these; and it certainly does not experience anything like the fierce tornadoes that we hear of at Miami and in many other parts of the world.

Comparison with Britain.

After this very imperfect summary of meteorological conditions that may be met with in various parts of New Zealand I will try to give a short general comparison of them with our own experiences

in Britain. But in this comparison I shall leave out of consideration the littoral area that I have described under Area A as having a sub-tropical climate ; for we have nothing here to compare with this northern part of the province of Auckland.

First, let me say that the weather in New Zealand is liable to the same quick changes and uncertainty that are the glory of our British climate.

I will make my comparison under four chief headings—viz. *Rainfall*, *Sunshine*, *Temperature*, and *Frosts*.

Rainfall.

There is no definite rainy season in New Zealand ; in fact, the rainfall in all parts is characterized by a more even average distribution amongst the months in the year than in this country. As in this country, the rainfall on the west coast is higher than in the centre or east. But the rainfall along the west coast of South Island is much heavier than anything in Britain, with the possible exception of the remarkable but isolated records from Seathwaite. Over New Zealand generally it would be heavier than in Britain as a whole. In spite of this, the time taken for precipitation of rain in New Zealand is less than in this country. High falls in 24-hour periods are much more frequent. In short, when it wants to rain in New Zealand it sets about its job in a businesslike way. With the exception of what I may call the small dull south-east corner, New Zealand knows little of fogs or of damp days and weeks in which, though it is always wet, there is barely $\frac{1}{2}$ -inch of rainfall recorded in a week.

Sunshine.

As a result of the above businesslike method of precipitation of rain, New Zealand can show us a glorious record of bright sunshine.

Of thirty-one stations in New Zealand from which I have records, all but the two in what I have already called the small dull south-east corner give us records ranging from 44·6 per cent. to 62 per cent. of the possible sunshine in the year. As against these figures, the best records that the British Islands can show are 43 per cent. in the Channel Islands and 41 per cent. at Felixstowe, Bognor and Worthing, whilst many places return records as low as from 21 to 30 per cent. In other words, New Zealand's best place has about 50 per cent. more sunshine than Britain's best ; and even the worst of New Zealand's comparatively poor returns shows 70 per cent. more than Scotland's worst.

Add to this the fact that New Zealand is 1,000 miles nearer to the Equator than Britain, and therefore that the sun's rays are there very much more vertical and consequently more potent. It is easy then to appreciate the enormous difference, both in quantity and quality, that there is between the sunshine of New Zealand and that of Britain ;

and to realize the tremendous effect this must have on the growth of plants and on the hardening of their tissues against the frost and cold of the coming winter and spring.

Temperature.

As far as actual highest summer shade temperatures are concerned, there is little to choose between those recorded in any part of New Zealand and those from many places in Britain. But in this connexion we must not forget the unfortunate prevalence in this country of long spells of cold north-east wind in the spring, which often continue till quite late in the summer months. These have the effect of giving Britain a very much shorter spell of warm summer weather than the amount that can be expected in New Zealand.

Frosts.

In the parts of New Zealand that we are considering frosts are fairly frequent. But, except at very high altitudes, these frosts seldom give a temperature below 24° F. They are usually of short duration. They seldom occur with an overcast sky ; so that one can confidently expect warm sunshine on the following day ; and this will prevent any cumulative effect of the night frosts. New Zealand knows very little of frosts of 20°, or of frosts which continue for days in damp and overcast weather ; or of the late spring frosts, of which we experienced so many even in our last glorious summer, as an adjunct to our persistent cold north-east wind. I am convinced that these late spring frosts, following, as they often do, short spells of warm weather, are more destructive to New Zealand plants than the longer and more severe frosts of midwinter. For many of our New Zealand trees and shrubs, having had no late frosts to contend with in their native land, have a habit of starting into growth very early in the spring. Then their tender new shoots fall easy victims to the later frosts.

FACTORS OTHER THAN METEOROLOGICAL.

Another factor that may help to explain the difficulty that many of these plants have in surviving in England is that a considerable proportion of the New Zealand flora is of tropical or sub-tropical origin. Cut off, as I have already described, from their former northern homes, they had to do the best they could to accommodate themselves to the cooler conditions in which they were placed. It is not difficult to understand that they might not be able to carry that adaptation far enough to survive in the still less genial climate that they find here.

What I have said above refers mainly to plants of lowland or coastal origin. With the beautiful alpine plants of New Zealand, such as *Celmisia*, *Myosotis*, *Ourisia*, and *Ranunculus*, it is not so much a question of temperature ; it is rather one of soil drainage, water supply and



FIG. 33.—*PRATIA ANGULATA*.



FIG. 34.—*SENECIO MONROI*.
Hardy shrub.



FIG. 35.—*OLEARIA AVICENNIAEFOLIA*.
Shrub. Fragrant.



FIG. 36.—*SENECIO LAXIFOLIUS*.
Hardy lax shrub.

sunshine. Some species are easy to accommodate, but others are very fastidious. In their native haunts they are accustomed to most intense cold in the winter and hot sun in the summer. Many of them grow in shingly grit, with perhaps some admixture of peaty soil, where there is a constant supply of water ; but there must at the same time be very free drainage and aeration at the roots. These conditions may be easily found on New Zealand's wet mountains, but they are not readily produced in our gardens. I am told that in New Zealand gardens the rhizomes of *Ranunculus Lyallii*, brought down from the mountains, will flower well for the first year, but can seldom be persuaded to survive for future seasons.

[The illustrations are from amongst photographs of plants grown by the author either in the open garden near Horsham, or under glass.]

DELPHINIUMS.

By C. F. LANGDON.

IN common with many other florists' flowers Delphiniums have during the last thirty years been vastly improved. This improvement is apparent in every way: the flowers are much larger, the spikes more shapely, and the colours more varied. In fact the plant has been lifted from its place as an ordinary herbaceous border plant and has attained the position of one of the most important of florists' flowers. Evidence of this is seen in the exhibits of numerous firms at the R.H.S. meetings and at all the important provincial shows.

I do not exaggerate when I say they are the Kings of the herbaceous border, flowering in the height of summer, throwing up their noble spikes to a height of 5 to 7 feet.

They fill a great place, giving as they do a range of colour unobtainable in any other direction. They are indeed indispensable and should fill an important place in all herbaceous planting schemes.

I have been interested in these stately and beautiful plants for forty years, as during the years 1890 to 1900 I had charge of a good collection, comprising the best varieties raised by Messrs. Kelway. I was fascinated by the wonderful colours then given by such varieties as 'Albert Edward,' 'Mrs. J. Stubbs,' and others. It was, however, ten years before I had an opportunity of raising a number of seedlings, and since that date our firm have raised annually from five to ten thousand with the object of obtaining improved varieties, the number varying. This work is intensely interesting, and to wander in a field of pedigree seedlings during the month of July is a great joy and something worth living for.

One of the chief characteristics of a normal flower is the corolla, consisting of six petals, two upper and four lower, the upper two being stiff and of horny substance with long spurs. These spurs fit together into the spur formed by the dorsal sepal.

In many of the newer varieties, the original structure is modified and altered in a remarkable manner. In some of the best the alteration in structure consists in an extra number of sepals or sepaloid petals, making a semi-double flower more or less circular in form. This change is often accompanied by an increase in the number of petals making up a large conspicuous corolla as in the well-known 'Rev. E. Lascelles' (figs. 37, 38).

There is, however, a remarkable variation in the size and number of petals forming the corolla, as well as in their colours. They vary

from white to black and are covered with fine hairs, often of brown or gold.

Now, as the corolla is so conspicuous, it plays a great part in determining the character of the flower. When white on a dark ground as in 'Edward Bromet,' the effect is very striking, and so it is when dark-brown or black on a pale ground, as in 'Millicent Blackmore,' but to many people these violent contrasts in colour are not pleasing. Here the plant is very accommodating, as there are plenty of varieties which do not offend in this. The effect of the light-coloured corolla on the pale mauve of 'Marjorie Ferguson,' or the dark corolla of 'R. A. Pilkington' on the purple petals and sepals, is less staring. In many varieties the corolla is quite inconspicuous, and as white or black petals are not apparent in these flowers we get a self-coloured effect which is often very beautiful (fig. 39).

In 'Mrs. Foster Cunliffe' we have the forerunner of a new race which, whilst not being fully double in the sense of being full with petals, has the inner petals curled inwards, covering up the extra number of ovaries it contains and giving a full rich appearance unequalled by any other Delphinium.

I submitted a flower of this variety to Mr. J. FRASER, and after dissection he describes it thus :

"Commencing in the centre of the *double* flower, I found seven nearly perfect ovaries or seed-vessels in two sets, the extra ones being outside the five original ones. Outside the ovaries were eight stamens with their ordinary filaments, and their anthers were open at the base where the pollen should have been, while their tops were converted into small imperfect ovaries, surmounted by styles and stigmas that were blue like those of the normal seed-vessels. Thus the stamens can get converted into seed-vessels on the inner side of the mass of stamens, and outwardly into petals, in this case very numerous and mauve in colour. Outermost of all were the normal five mauve and blue sepals."

This type is very valuable for its lasting qualities. As there is no pollen present to fertilize the flowers, they last until every flower on the spike is expanded and for some time afterwards ; this is a great advantage, as the flowering season of the Delphinium is all too short, for with the help of the bumblebees which pollinate the flowers as they open, in hot weather the bottom of the spike is often overblown before half the flowers are expanded.

Another valuable development containing many of the same characteristics as the last-mentioned variety is that which I think is well described as the 'Clematis-flowered' form (fig. 40). In this the stamens have been changed as described by Mr. FRASER and they are surrounded by several rows of petals, making up a circular flower of great beauty, and they are well placed on the spike in a light and graceful manner without any crowding.

There appears to be no finality in the variations that can be obtained by cross-fertilization and selection.

Double Delphiniums have been known for many years, but they have been rather interesting than beautiful. We grew the variety *Ranunculoides* for many years: a full double flower little bigger than a "bachelor's button." This with others we have discontinued growing as they were very stiff in habit. The latest double variety, however, 'Lady Bath,' has a fine stately habit, and the large fully double flowers are symmetrically placed on a bold spike and possess all the qualities of a first-rate variety.

It will be seen that with a plant giving such an endless variety of form, colour, and habit, there will be great difficulty in deciding what is an ideal florists' type, and if I gave an opinion upon this, probably many would disagree with me in my selection. The variety 'Millicent Blackmore' forms a most symmetrical spike, is of medium height with flowers well placed on pedicels carried at an angle which shows the flowers to the best advantage, and if judged on points would, I consider, be difficult to beat. A later variety of ours, however, 'Countess Cowley' (fig. 41), is in some respects better, the flowers have more substance and its spike is longer and fuller than the first named. Comparing the two I would place 'Countess Cowley' first for length of spike and substance of flower, but 'Millicent Blackmore' would still be favourite as a garden plant. My ideal would be a plant combining the best characteristics of both.

This would give a plant 5 feet 6 inches in height, with 2 to 3 feet of flower. The spike would be about 6 inches wide at base, tapering to the top, and the flowers $2\frac{1}{2}$ to 3 inches in diameter, semi-double, with well-defined corolla, the corolla dark or light according to the colour of the flower, well shaped, and not striped as are many. This would be an ideal variety with semi-double flowers, providing that the colouring was pleasing to the eye (a very important condition, as so many varieties one sees have peculiar mixtures of colour that one can hardly call beautiful). My ideal then, and I hope to live to see it, is such a plant as I have described with azure flowers without shading.

This matter of colours in Delphiniums is very important, and I consider that the nearer one gets to a self colour the more pleasing it is. This opinion is strengthened more and more by hearing the comments of visitors to the nursery and the spectators at the various shows.

The variety 'Statuaire Rude' first gave us a self mauve colour. It was raised by M. LEMOINE and introduced by my firm, gaining an A.M. in 1908. This plant has played an important part as a producer of large-flowered types, and although I do not know its origin, I should imagine it to be different from the English varieties which preceded it. It has one great defect. It is of very succulent growth, making stems sometimes 2 inches in diameter, and these sappy growths often succumb to the wet of an English winter.

There is no doubt that the pleasing shades of mauve have done much to popularize the Delphinium, including as they do all shades from the palest lilac to the deepest heliotrope. At the same time



FIG. 37.—VARIOUS STAGES OF DOUBLING IN DELPHINIUMS

[*Top face p. 116.*



FIG. 38.—TYPES OF DOUBLE AND SEMI-DOUBLE DELPHINIUMS.

blue is the greatest desideratum, and it is to Delphiniums we look to provide this colour for the herbaceous borders.

We have to depend chiefly upon the singles as yet for this colour, as there are no semi-doubles to take the place of 'Blue Boy,' 'Mrs. Townley Parker,' and 'Constance' in the borders. We are, however, making great strides in this direction, and although not bearing large spikes the varieties 'Blue Bird,' 'Mrs. Paul Nelke,' and 'Lady Grace' are the colours we have sought, and I do not doubt that we shall soon be near our ideal of a giant type of self blue colour.

Delphiniums should be planted in groups of not less than three, and in large borders the groups may consist of five or seven plants, and they are more effective if each group is formed by a separate variety.

The fact that they vary so much in height gives great scope to the gardener, as they range from the 2 feet of the Belladonna section to the 6 or 7 feet of the large-flowered kinds.

Delphiniums are the aristocrats of the herbaceous border, and if they are to be seen at their best, their rather fastidious tastes must be attended to. Should the soil be impoverished, as it so often is, by the roots of strong-growing perennials, such as Asters and Sunflowers, a heavy dressing of manure should be worked in before planting, and this can be supplemented with advantage by a mulching of well-decayed manure when the plants have started well in the spring. I am sure that a great deal of the disappointment experienced by growers, both amateur and professional, is through inattention to these details.

Delphiniums should be lifted and replanted every three or four years, as old stools are apt to decay in winter. They can then be divided and replanted. As, however, they are never so strong the first year after division, to avoid gaps in the border it will be well not to lift all at once.

PROPAGATION.

There are three modes of propagation: from seeds, from cuttings, and by division. Raising seedlings is much the easiest way of obtaining a large stock, but as they are so readily cross-fertilized by insects, the resulting plants are very variable in quality, and unless one has room and time to grow a large number and to discard the poor varieties, it is much better to obtain good named varieties.

Seed may be sown as soon as gathered, usually towards the end of August. It is best sown in boxes, as these can be so much more readily watched and kept safe from slugs.

The young plants can be grown on in cold frames until the autumn cold checks the growth and they rest for the winter. They will require very little attention until the spring, when they commence growth. They should then be transplanted to other boxes, giving them room enough to make strong plants, and at the end of April they will be ready to plant in the open ground.

Give them enough room, say 15 to 18 inches apart, as they will make large plants by the autumn. Many of them will flower during the first year, but it is not until the second year that

they reach their full stature and it will be possible to determine the quality of the varieties raised.

Named varieties are propagated from cuttings, these being taken off the young shoots in the early spring. They should be made when about 3 inches long, taking care to get the heel of the cutting by making the incision close to the root-stock. They root readily if inserted in sandy soil and placed in a cold frame, kept close and shaded from strong sunshine. When rooted, plant in nursery beds 9 inches apart, and transplant either in September or the following March to their permanent positions in the border.

Another method of propagation and one most generally adopted by gardeners is that of division. This can be done in the early autumn or when growth commences in the springtime, the latter being, in my opinion, much the safer and better plan. It is courting disaster to divide and replant during the cold wet winter months. Especially is this so, should the soil be of a cold clay as is our own. Should it be necessary to lift old clumps in mid-winter, they can be prepared for replanting and laid in a bed of ashes or sandy material until the spring, or they can be potted up and kept in cold frames until planting time in March or April.

FLOWERS FOR EXHIBITION.

To grow flowers for exhibition it is necessary that the plants should be 'done well' in every sense of the term.

They are gross feeders and delight in rich deep loamy soil with which has been incorporated plenty of decayed cow-manure. If possible the soil should be worked to the depth of 2 feet 6 inches to 3 feet, and in any case as deeply as possible.

Plant in September, but if that is not possible, wait until March, as it is not advisable to plant in late autumn. Planting then is a frequent cause of failure, especially in cold and wet soils. If, however, the grower should have a light, well-drained soil to deal with he may be able to plant at a later or earlier date than that I have recommended, as so much depends on soil conditions and especially drainage.

Good plants should be selected with plenty of young roots, and those raised from cuttings are preferred. Good flowers may be expected the first year, but the best results are obtained in the second year when the plants will be well established with a mass of roots, sufficient in a good plant to fill a bushel basket. In the second year the plant will probably throw a number of shoots—many more than are required. These should be thinned when about 6 inches in height, leaving three to seven according to the variety and the space allotted to the plants. Crowding should be avoided, and if possible a space of 4 feet from plant to plant should be given. There is no comparison between plants that have plenty of air space and those that are crowded, and if the best results are desired the space I have mentioned will be none too much.

The Delphinium is a succulent plant and makes its growth very quickly during warm days in May and early June, sometimes putting on 3 inches a day. It is therefore important that during this time abundance of water be available, and if the weather be dry the plants must be well watered. When watering give sufficient to soak the roots, remembering that these extend some feet from the stools and to a good depth.

The position of the bed is an important factor in cultivation, as also is the kind of soil in which the plant is grown. An open position is undoubtedly the best, and if sheltered from the south-westerly winds so much the better. Delphiniums are very accommodating as to soils, as they make a good show in either peat, sand or clay if their requirements are studied, but the effect of the different soils on the growth of the plants, their height, the size of the flowers, etc., is enormous. In 1925 we visited Wisley to view the trials there, and were much surprised at the difference in habit of the varieties we had sent for trial, in fact we hardly recognized some of them. They were all much taller than in the nursery, some being as much as 3 feet higher, and though the growth was so strong and vigorous, the flowers were not so large and the spikes were attenuated and thinner. The soil at Wisley appeared to be sandy peat, whilst that at the nursery is heavy loam with a subsoil of clay.

The greatest enemy of the Delphinium is that terrible garden scourge the slug. It seems to me that the slug will leave any other plant to get at the young succulent shoots during February and March. That being the time of the greatest danger, steps must be taken to prevent the attack.

A good plan is to clear the soil away from the crown in January, then cover with sharp gritty ashes to which a good sprinkling of soot has been added. They cannot crawl over or burrow into the ashes, and the young shoots push their way safely through, whereas without the covering of ashes the gardener may watch in vain for the young shoots to appear. The crown of the plants being a natural harbour for slugs, they eat the young shoots before they can break through the soil.

In some districts mildew is very troublesome during the autumn months, and in wet weather it is very difficult to deal with. It usually makes its appearance in July, and the grower should watch for its first onset, and immediately dust the plants with sulphur. Green sulphur is the best, being very fine and less unsightly than the yellow.

Mildew kills the autumn growths and consequently prevents the plants giving a second lot of bloom, as they should do, and will, if the mildew is prevented.

I am glad to say that we have now a number of varieties that are proof against attack, and this increases their value as border plants very much indeed, especially by the fact that the plants keep their

foliage, and if the old flowers are taken off in time they give a good display in autumn.

I have noticed that the immune varieties have smooth shiny leaves, whilst others are more or less hairy. This suggests that it is the night dew resting on the leaves and taking a long time to dry that is the cause of the mildew.

A few of the named varieties that are immune are 'Robert Cox,' 'Lavanda,' 'Nora Ferguson,' 'George Cochran,' and 'Lady Gwendolin.' This list will soon be supplemented by others which we have lately raised.

CULTIVATION IN POTS.

The Delphinium is a fine plant for pots and is very valuable for conservatory and house decoration during May and early June.

I know there is a prejudice against growing Delphiniums so, but I am satisfied that this will disappear as time goes on and gardeners realize how valuable they are at a time when flowers are generally scarce and how useful they would be for decoration. Another great advantage is that the season of flowering is extended for a month or six weeks.

The flowers grown under glass are more delicate in colouring and some of the lavender and mauve shades are very lovely, the beauty of the softer colours being much enhanced when given the protection of a house.

To get good results the plants should be potted up into 8- or 9-inch pots in the late summer or early autumn, so that they have time to get established before the winter, using a rich compost not too light in texture. Pot firmly and stand on beds of ashes until November, when the pots should be covered with ashes or placed in a cold frame to prevent the pots being frozen.

In February they can be brought into a house but, they will require no fire heat unless the weather should be very severe. Grow on steadily, giving all the light possible and plenty of ventilation to keep the growth sturdy.

The shoots should be reduced in number to two or at most three to a plant, as this will be enough for them to carry in the confined space of an 8-inch pot. They will require liberal applications of liquid manure when the plants are about a foot in height and the roots begin to be active. This should be continued until they are in bloom.

It will be found that they take a lot of water, and it is imperative that they should not suffer from neglect in this respect or failure will result.

An orchard house or any lofty but airy structure is suitable for their cultivation, and if well grown I am sure the labour expended will be amply repaid by the beautiful spikes of flowers which will be produced.



FIG. 39.—VARIETIES OF "EYE" IN DELPHINIUMS.

[To face p. 120.]

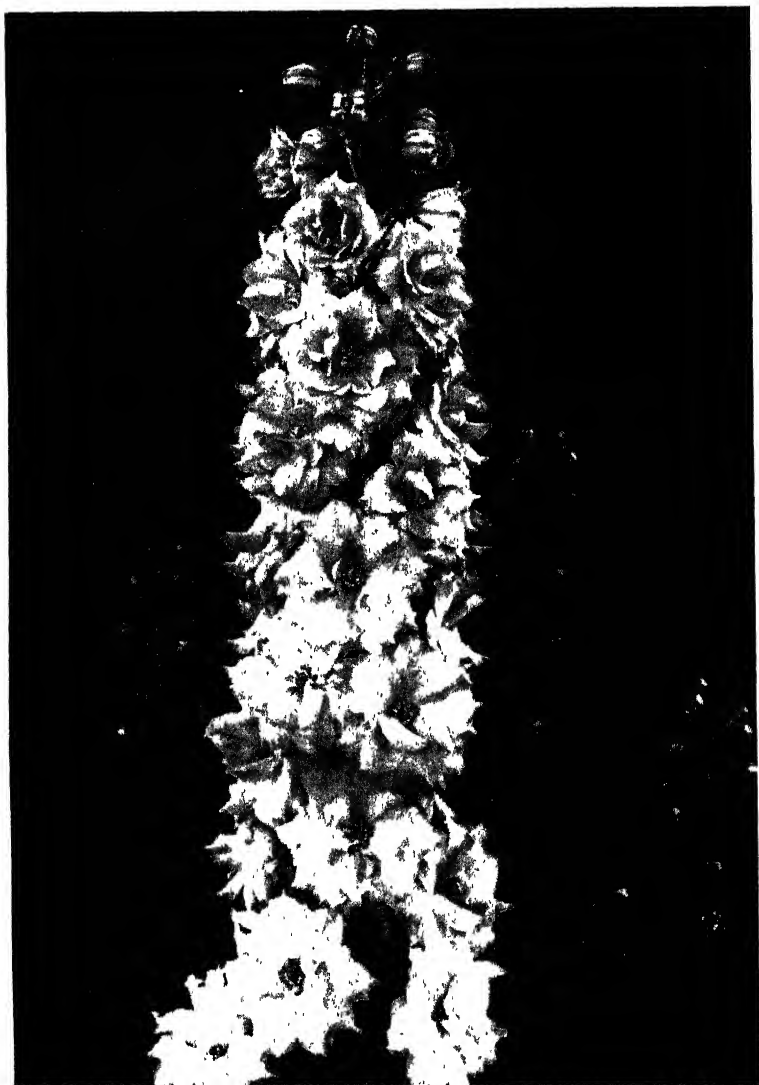


FIG. 40.—DELPHINIUM 'LADY MAY.'

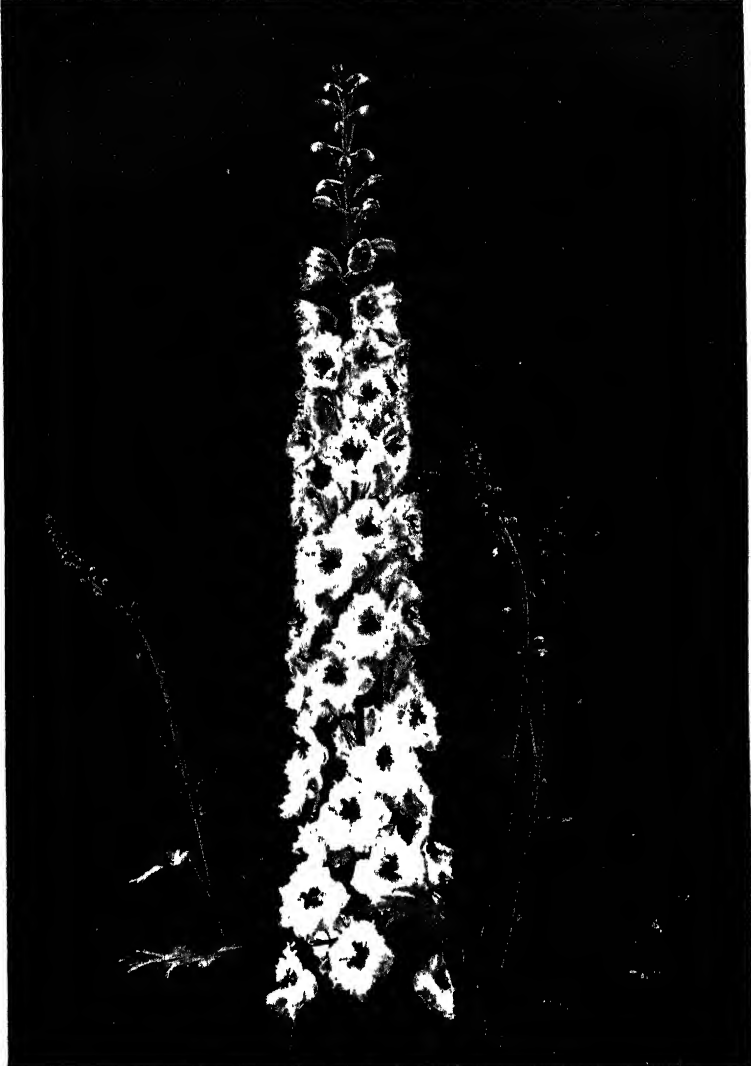


FIG. 41.—DELPHINIUM 'COUNTRESS COWLEY.'

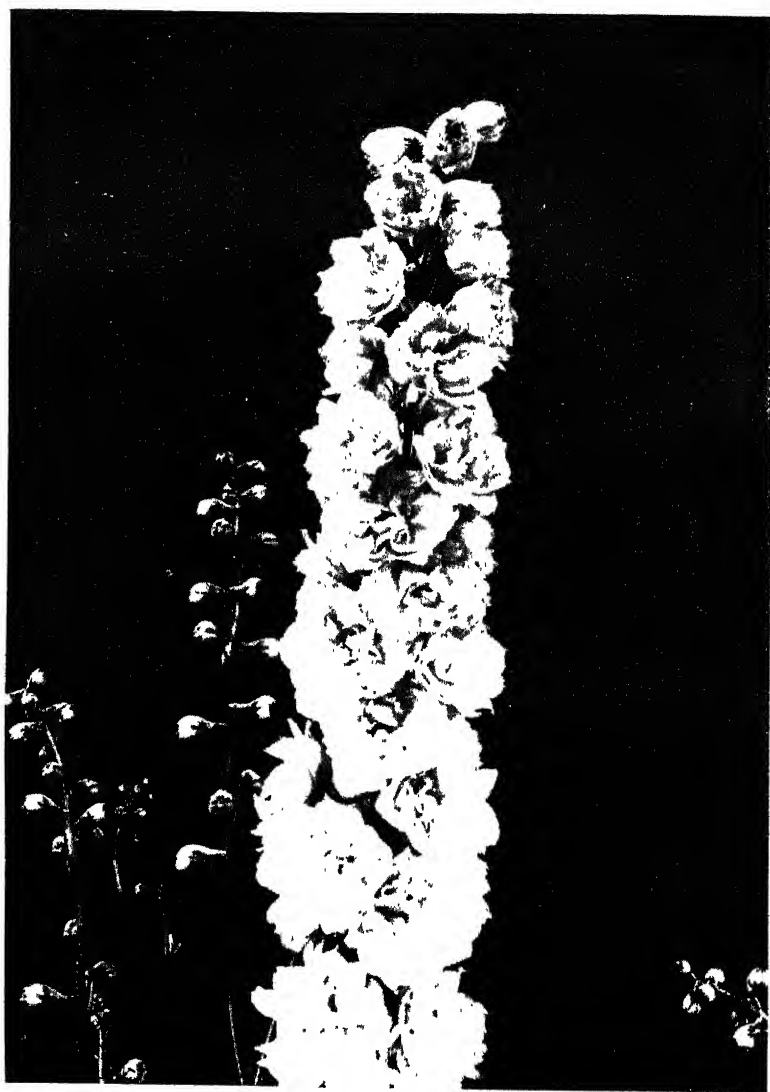


FIG. 42.—DELPHINIUM 'LADY ELEANOR.'
Sky blue, double

THE AWARD OF GARDEN MERIT.—XV.

By F. J. CHITTENDEN, F.L.S., V.M.H.

115. DAPHNE MEZEREUM.

Award of Garden Merit, March 11, 1929.

THERE are some plants that are seen to do much better in the cottage garden than elsewhere, and among them more than one that so charms everyone by some outstanding feature of form or colour or scent that all would possess it if they could. The Madonna Lily is one, *Daphne Mezereum* is another. One sees hedges of the Daphne in some cottage gardens, yet planted in another garden it fails entirely, or grows but poorly, or flourishes for a while and then unaccountably dies suddenly. It is so hardy that it has made itself at home here and there in copses and woods, and is, by some, regarded as a true native of England. It occurs wild over most of Europe (except Greece), and in Siberia. Possibly its preference for shady places gives a clue to its requirements. In cottage gardens the plants are usually so crowded that they shelter one another and the stems and soil are shielded from the sun. Some Daphnes certainly will not survive long if their stems are exposed to hot sun. At any rate, hot, dry places are not those to choose for it. It will grow in calcareous soil, though it does not demand lime.

Its few stiff branches reach a height of two or three feet. They are set all along the last year's twigs with flower buds which open from February to April, before the leaves appear, into bright purplish-red clusters of flowers, bright enough, but chiefly valued for their perfume, since they scent the air far around. The poisonous berries, nearly $\frac{1}{2}$ -inch across, are bright red, and the seeds germinate freely when fresh and give a ready means of propagation. Like all the Daphnes this is rather difficult to transplant and is best set while still a seedling in the place it is to occupy. Where the plant is at home it often seeds about quite freely.

There are two or three white-flowered forms, the pure white being especially delightful, and clean in colour. Most, however, have an ivory or creamy tint and are apt to look a little faded. These albinos (if not crossed with neighbouring pink forms, by the insects that honey and odour attract to the flowers) come true.

There is also a form commencing to flower in October with larger flowers than the type and perhaps even brighter. It is called *D. Mezereum grandiflora*.

116. ANEMONE JAPONICA.

Award of Garden Merit, November 14, 1929.

ROBERT FORTUNE, when he was collecting for the Horticultural Society of London, found this plant in a garden near Shanghai, and sent it home. It was received at Chiswick on June 20, 1844, and flowered in August 1845. It was then regarded as a greenhouse plant (see JOURNAL R.H.S., 1, p. 61) and considered of importance from its autumn-flowering habit.

It was soon figured, and Miss DRAKE's drawing in the *Botanical Register* of 1845, t. 66, shows a flower about three inches across with about twenty rather narrow segments, some of them slightly lobed, the outer green, the inner bright reddish-purple. This first plant was evidently of garden origin, but, long before, THUNBERG had described it as an inhabitant of damp woods, on the edges of rivulets, on Mt. Kifune, near Miako, in Japan. He tells us it was much cultivated in Japan for its beautiful purple flowers, that it was propagated by offsets, and that its seeds rarely ripen. SIEBOLD records it as occurring at considerable elevations in Central Japan and infers it would be likely to bear even a continental climate (see SIEBOLD'S *Flora Japonica*, 1, p. 16, t. 5, the first figure). This note was written in December 1845, and by that time Dr. LINDLEY had come to the conclusion that it was "probably better suited to the open border, at least during summer, and it is probable that it will not suffer even from the cold of winter." And outside it was put.

In December 1847 a figure (t. 4341) appeared in the *Botanical Magazine* still showing somewhat double flowers, and now the note tells us that "it is perfectly hardy, and has endured, unharmed, the winter of 1846-7, in the open air. A moist soil seems most favourable to its success." His picture shows rather broader floral segments and fewer of them. Neither, however, shows the beautiful silky down on the exterior of the sepals. SIEBOLD, too, saw double flowers.

It was not until the Chinese flora began to be collected that the single form reached us from Hupeh (not from Japan), although single forms had arisen in gardens meanwhile, and that was christened *A. hupehensis*. That name we may regard as unnecessary, but it was attached to a very charming rose-flushed flower, which we prize greatly at Wisley. But we prize, too, nearly all varieties of this plant, from the large-flowered white forms, through the *elegans* type, with its broad leaves and pink flowers, to the deeper, almost purple varieties that one sometimes sees. Nearly all are worth growing, and nearly all, when once established, flourish almost too well. The plant is perhaps a little difficult to start at first (it moves best in spring), but later it is often very difficult to stop, for it makes buds upon its roots and not even a gravel path will stay its spread. There is one variety remarkable for the beauty of its foliage, so crimped and cut as to look like a giant parsley and well named *crispifolia*. Mr. BOWLES tells us in *My Garden*

that only when it has settled down does it produce this remarkable foliage, but it is worth waiting for, even if it takes a year or two to get over its youthful waywardness and settle down to a staid and lovely old age.

In fruit the single forms make balls of white fluff, which are quite ornamental in the border.

Finally, though THUNBERG reports it as a woodland plant, do not think that in this country it needs shade. It does not. It may to some extent tolerate it, but it is more happy in the sun, and a place in the sun, so long as the soil is moist, suits it best.

117. BERBERIS VERRUCULOSA.

Award of Garden Merit, December 11, 1929.

That great genus *Berberis* comprises both evergreen and deciduous shrubs and some which are on the border line. *Berberis verruculosa* belongs to the evergreen section, and a very decorative plant it is. The only improvement one can suggest is that it should bear long bunches of coral berries to contrast with its handsome dark green, shiny foliage, but alas, this grace it does not possess, for its berries are black and not very freely borne! In hardiness, in neatness of form, in the gentle grace of its restrained arching stems set close with shining, small prickly leaves, and in its moderate size, about 3 feet 6 inches high and perhaps a little more through, it has everything to recommend it. Plant it while it is young, and put it where it will grow uncramped, in the sun or semi-shade and in soil not too dry, and it will thrive without need of pruning, and yearly grow in beauty. As in a few others of the genus, the dying leaves in autumn assume a brilliant scarlet hue, so that here and there that touch of colour that the desired scarlet berries would give, is given by the older leaves.

Mr. E. H. WILSON introduced it from Western China for Messrs. VEITCH in 1904, and it is one of the best of his many good introductions. It is figured in the *Botanical Magazine* at t. 8454.

118. PRIMULA DENTICULATA.

Award of Garden Merit, May 6, 1929.

Primula denticulata is not one of the newest *Primulas*. It was introduced in 1842 from the mountains of North India and is the type of a small group of *Primulas* spreading thence eastwards, some of them easy to cultivate. They are plants of moist soils, growing best in damp leaf-mould or soil mixed with leaves, and are characterized by their rosettes of oblong, wrinkled, toothed, hairy leaves growing at first more or less erect, and more or less covered with white or golden meal. The small flowers are grouped in dense, round, many-flowered heads carried high on a stout mealy stem. *P. denticulata* has bright

lilac flowers about $\frac{1}{2}$ -inch across, in rather wide close heads, on 8- to 10-inch rather dark scapes from March onwards. It likes bright sun when it is in a moist spot, but will not thrive in a dry. Dr. WATT has written so much of this *Primula* in our JOURNAL (39, 155) that it is unnecessary to write more, except to say that his observations of differences in stature in wild plants may be repeated in any garden where many of this species are cultivated.

There is some variation in the colour of the flowers, but the most marked variation is seen in the variety *cachemiriana*, described first in *The Garden* by Mr. MUNRO from plants collected in Kashmir. It was there named as a distinct variety, but it has no real claim to this position, since it differs from *denticulata* mainly, if not solely, by its golden instead of white meal.

[The notes on the first one hundred plants to receive the Award of Garden Merit, which appeared in the JOURNAL, vols. 47 to 53, have been published in pamphlet form, and may be obtained from the R.H.S. Office, Vincent Square, Westminster, S.W. 1. For late notes see vol. 54, pp. 218 and 423.]

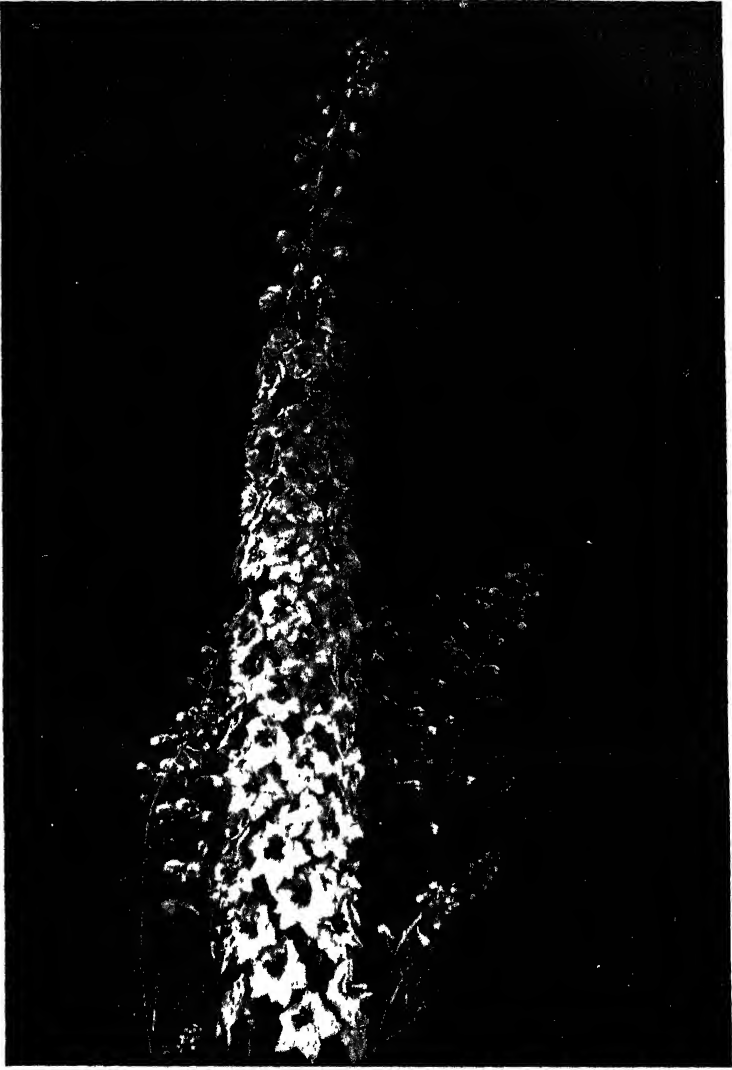


FIG. 43.—DELPHINIUM 'LADY IRENE.'
Small flowers. Well-shaped spike.



FIG. 44.—DELPHINIUM 'PHILIP BUTLER.'
Deep blue.

DAHLIAS TRIED AT WISLEY, 1929.

THE trials of Dahlias were continued at Wisley in 1929 on the same lines as for some years past, the varieties which in former trials received awards being grown as the "standard collection," against which the seedlings selected in 1928 at Vincent Square when shown before the Society there, were compared. A number of varieties which are regarded in British Columbia as of outstanding excellence, kindly sent by General McRae, were also included.

Two hundred and sixty-nine varieties were grown this year, of which fifty-three had been selected for trial in 1928 and thirteen came from General McRae.

A joint committee comprised of representatives of the Royal Horticultural Society and the National Dahlia Society judged the trials on August 29 and September 16, and made recommendations for awards. At the request of the National Dahlia Society they also selected what they considered to be the best seedling of the year, viz. 'Baldré,' a small-flowered decorative variety, and the National Dahlia Society bestowed its Gold Medal upon it.

The classification followed is that adopted in previous reports, and it is described fully in this JOURNAL, vol. 47, p. 56.

AWARDS, DESCRIPTIONS, AND NOTES.

CLASS I.

Single Dahlias.

AWARDS.

Red Riding Hood, A.M. August 29, 1929. Raised by Messrs. Goos & Koene-mann and sent by Messrs. C. G. Van Tubergen of Haarlem, Holland; it is also known as 'Roodkapje' and under this name was sent by Messrs. Carter Page of London Wall, E.C. [H.C. 1927].

Mrs. Bealey, H.C. August 29, 1929. Raised and sent by Messrs. J. Cheal of Crawley, Sussex.

Orange suffused scarlet.

MRS. BEALEY (Cheal), H.C.—5 feet. Flowers $3\frac{1}{2}$ to 4 inches, type B; tips rose-pink shading to orange, suffused scarlet at the centre; free, erect, on 9- to 16-inch stalks, well above foliage.

Scarlet.

IDA (Cheal).— $4\frac{1}{2}$ feet. Flowers 3 inches, type A; rich scarlet, tips orange; free, erect, on 9- to 14-inch stalks, well above foliage.

MRS. J. F. McLEOD (Cheal).— $4\frac{1}{2}$ feet. Flowers 3 inches, type A; rich glowing scarlet; free, erect, on 9- to 12-inch stalks, well above foliage.

RED RIDING HOOD (Van Tubergen), A.M.— $3\frac{1}{2}$ feet. Flowers 3 to $3\frac{1}{2}$ inches, type B; scarlet; very free, on 4- to 6-inch stalks, well above foliage.

CLASS 2.

Mignon Single Dahlias.

AWARD.

Mrs. Wm. Clarke, A.M. August 29, 1929. Raised and sent by Mr. H. Woolman of Shirley, Birmingham.

Rosy-red and orange.

MRS. WM. CLARKE (Woolman), A.M.—28 inches. Flowers 3 inches; rosy-red on orange; very free, erect, on 3- to 7-inch stalks, well above foliage.

Crimson.

LECOLT GEM (Proctor).—2 feet. Flowers 3 inches; deep rich crimson; free, erect, on 4- to 8-inch stalks, above foliage.

CLASS 3.

Collerette Dahlias.

AWARD.

ERIKA, A.M. September 16, 1929. Raised and sent by Messrs. W. Treseder of Cardiff.

Maroon.

ERIKA (Treseder), A.M.—5 feet. Flowers 4 to 4½ inches; rich velvety crimson-maroon, crimson tipped white collerette; very free, erect, on 8- to 12-inch stalks, well above foliage.

CLASS 5.

*Paony-flowered Dahlias.**White.*

WHITE SWAN (Turner).—5½ feet. Flowers 5 to 6 inches; free, erect, on 9- to 14-inch stalks, just above foliage.

Scarlet.

ELITE GLORY (McRae).—4 feet. Flowers 5 inches, tips tyrian-rose shading to rich scarlet at centre; inner petals channelled; free, drooping, on 6- to 12-inch stalks, above foliage.

CLASS 6.

Small-flowered Paony Dahlias.

AWARDS.

CORA, A.M. September 16, 1929. Raised and sent by Mr. C. Turner of Slough [H.C. 1927].

DORRET, A.M. September 16, 1929. Raised and sent by Messrs. J. Burrell of Howe House Nurseries, Cambridge.

JANE, H.C. August 29, 1929. Raised and sent by Messrs. J. Burrell.

MRS. A. F. DUTTON, H.C. August 29, 1929. Raised and sent by Mr. A. J. Cobb, The University, Reading.

TANGLEWOOD, H.C. September 16, 1929. Raised and sent by Messrs. W. Treseder.

YVONNE SALMON, H.C. August 29, 1929. Raised and sent by Mr. A. J. Cobb.

Yellow.

SUNFLOWER (Turner).—3½ feet. Flowers 4 to 4½ inches, pale lemon-yellow; free, erect, on 9- to 14-inch stalks, well above foliage.

Pink on Yellow.

BEULAH (Burrell).—4 feet. Flowers 3½ inches; orange-pink, centre pale sulphur, margins narrowly edged scarlet; free, erect, on 9- to 14-inch stalks, well above foliage.

CORA (Turner), A.M.—Described R.H.S. JOURNAL, vol. 53, p. 170.

Pink.

QUEENIE HART (Burrell).—3¾ feet. Flowers 4 to 4½ inches; amaranth-pink, fades; free, drooping, on 6- to 12-inch stalks, well above foliage.

DORRET (Burrell), A.M.—4 feet. Flowers 4 to 4½ inches; bright tyrian-pink; free, erect, on 9- to 15-inch stalks, well above foliage.

Rose.

RAE (Burrell).—5 feet. Flowers $3\frac{1}{2}$ to 4 inches; tips rosolane-purple passing to rosy-crimson at centre; free, erect, on 9- to 15-inch stalks, well above foliage.

LEITA (Burrell).— $3\frac{1}{2}$ feet. Flowers 4 inches; dull liseran-purple on yellow, zoned crimson at centre; free, somewhat drooping, on 6- to 10-inch stalks, well above foliage.

S. G. TEVIS (McRae).—4 feet. Flowers 4 inches; light dull phlox-purple; free, erect, on 6- to 10-inch stalks, above foliage.

Orange-scarlet.

AILSA (Burrell).— $3\frac{1}{2}$ feet. Flowers 4 inches; glowing old rose shaded orange; petals channelled; free, erect, on 6- to 12-inch stalks, well above foliage.

SOUTHDOWN (Cheal).— $5\frac{1}{2}$ feet. Flowers $3\frac{1}{2}$ to 4 inches; bright orange-scarlet; free, erect, on 9- to 16-inch stalks, well above foliage.

MRS. A. F. DUTTON (Cobb), H.C.— $3\frac{1}{2}$ feet. Foliage tinged purple. Flowers 4 to $4\frac{1}{2}$ inches; bright orange-scarlet; petals channelled when young; free, erect, on 9- to 14-inch stalks, well above foliage.

KIRRY LLOYD JONES (Cobb).— $3\frac{3}{4}$ feet. Foliage purple. Flowers $3\frac{3}{4}$ to 4 inches; bright glowing orange-scarlet, fades; free, erect, on 9- to 12-inch stalks, well above foliage.

Scarlet.

JANE (Burrell), H.C.— $3\frac{1}{2}$ feet. Flowers $3\frac{1}{2}$ to 4 inches; dull pale rosy-scarlet, centre crimson, fades; free, erect, on 9- to 14-inch stalks, well above foliage.

LULU (Burrell).—5 feet. Flowers $3\frac{1}{2}$ inches; scarlet-red, tips paler, fades; free, erect, on 9- to 15-inch stalks, well above foliage.

TANGLEWOOD (Treseder), H.C.— $3\frac{1}{2}$ feet. Foliage purplish-green. Flowers $3\frac{1}{2}$ to 4 inches; bright scarlet-red; free, erect, on 6- to 12-inch stalks, well above foliage.

YVONNE SALMON (Cobb), H.C.—4 feet. Foliage purplish-bronze. Flowers 3 inches; scarlet; free, erect, on 9- to 15-inch stalks, well above foliage.

HYPERION (Burrell).—5 feet. Flowers 4 to $4\frac{1}{2}$ inches; bright scarlet; free, erect, on 6- to 12-inch stalks, well above foliage.

LYRIC (Burrell).—4 feet. Flowers 4 to $4\frac{1}{2}$ inches; rich scarlet, fades very much; free, stems erect, flower drooping, on 9- to 12-inch stalks, well above foliage.

PILATUS (Cheal).—4 feet. Flowers $3\frac{1}{2}$ to 4 inches; rich scarlet; free, erect, on 9- to 18-inch stalks, well above foliage.

HEBE (Burrell).— $3\frac{1}{2}$ feet. Flowers 4 to $4\frac{1}{2}$ inches; dull crimson-scarlet, fades; free, erect, on 9- to 15-inch stalks, well above foliage.

CLASS 8.

Decorative Dahlias.

AWARDS.

Pride of Crawley, A.M. September 16, 1929. Raised and sent by Messrs. J. Cheal.

White King, A.M. August 29, 1929. Raised and sent by Messrs. J. G. Ballego, Leiden, Holland.

Premier, A.M. September 16, 1929. Raised and sent by Messrs. J. Stredwick of Silverhill Park, St. Leonards.

R. Findlay, A.M. September 16, 1929. Raised and sent by Messrs. J. Stredwick.

Mrs. John Crowther, A.M. September 16, 1929. Raised and sent by Messrs. J. Stredwick.

R. Treat, A.M. September 16, 1929. Sent by General A. D. McRae of Vancouver, Canada.

Miss G. Kenkeel, A.M. September 16, 1929. Raised and sent by Messrs. P. Majoor of Baarn, Holland.

Fantasy, A.M. September 16, 1929. Raised and sent by Messrs. J. Stredwick.

Mareehenschön, H.C. September 16, 1929. Raised by Mr. Engelhardt and sent by Messrs. H. Carlée of Haarlem, Holland.

Rev. S. Marriott, H.C. September 16, 1929. Raised and sent by Messrs. J. Stredwick.

Ludwig Thoma, H.C. August 29, 1929. Raised by Mr. Henrichsen and sent by Messrs. R. A. Van der Schoot of Hillegom, Holland.

Lady Snagge, H.C. September 16, 1929. Raised and sent by Messrs. J. Cheal.

White.

PRIDE OF CRAWLEY (Cheal), A.M.—4½ feet. Flowers 5 to 6½ inches; white, centre ivory; free, erect, on 9- to 15-inch stalks, above foliage.

WHITE KING (Ballego), A.M.—Described R.H.S. JOURNAL, vol. 54, p. 227.

ALBASTRE (Vianen).—4 feet. Flowers 6 to 7½ inches; white, centre ivory; petals somewhat pointed, margins at tips recurved; free, erect, on 12- to 15-inch stalks, above foliage.

Yellow.

R. FINDLAY (Stredwick), A.M.—5 feet. Flowers 6 to 7 inches; clear light greenish-yellow; inner petals channelled, outer flat; very free, erect, on 9- to 15-inch stalks, well above foliage.

CARMANIA (Stredwick).—4½ feet. Flowers 6 to 7½ inches; light greenish-yellow, inner florets faintly tinged scarlet and curled; free, erect, on 6- to 10-inch stalks, at first hidden by foliage, afterwards above.

PREMIER (Stredwick), A.M.—7 feet. Flowers 7 to 8 inches; rich lemon-yellow flushed amber, tips white, petals incurved, margins recurved; free, erect, on 9- to 15 inch stalks, above foliage.

SUNBEAM (Ridder Huyssen van Kattendyke).—4½ feet. Flowers 5 to 6 inches; amber-yellow, middle and base of petals lightly suffused scarlet; free, erect, on 6- to 12 inch stalks, above foliage.

D. CAMPBELL (Stredwick).—6 feet. Flowers 6 to 7 inches; rich strontium-yellow, margins of petals recurved at tips; free, erect, on 9- to 16-inch stalks, at first hidden by the foliage, afterwards above.

Pink on Yellow.

MAMMOTH JEWEL (McRae).—4½ feet. Flowers 5 to 5½ inches; eosine pink on lemon-yellow; free, stem erect, flowers drooping, on 6- to 10-inch stalks, above foliage.

MARCEHENSCHÖN (Carlée), H.C.—5 feet. Flowers 5 inches; rose on cream, margins of petals apricot and recurved; free, somewhat drooping, on 9- to 20-inch stalks, above foliage.

JERSEY ELEGANS (McRae).—6 feet. Flowers 5 to 6½ inches; rose on creamy-yellow, margins of inner petals somewhat recurved; free, drooping, on 9- to 14-inch stalks, above foliage.

Pink.

BARBARA WEIR (McRae).—4 feet. Flowers 5 to 6 inches; pale rosolane-purple on white; free, drooping, on 6- to 12-inch stalks, above foliage.

MISS ANNIE LILE, J.P. (Stredwick).—4 feet. Flowers 6 to 7 inches; pale rosolane-purple, centre darker, petals somewhat twisted; free, erect, on 6- to 12-inch stalks, at first hidden by the foliage, afterwards above.

MRS. JOHN CROWTHER (Stredwick), A.M.—4 feet. Flowers 6 to 7 inches; pale rosolane-purple, petals somewhat twisted, middle speckled darker, and margins somewhat recurved; free, erect, on 6- to 12-inch stalks, at first hidden by the foliage, afterwards above.

ELINOR VAN DER VERE (McRae).—6 feet. Flowers 5 to 6½ inches; mallow-pink, petals channelled; free, drooping, on 9- to 14-inch stalks, above foliage.

Rose.

KITTY DUNLOP (McRae).—5½ feet. Flowers 5 to 6 inches; mallow-purple; free, drooping, on 6- to 10-inch stalks, above foliage.

ALMONT (McRae).—6 feet. Flowers 5 inches; bright tyrian-pink, base tyrian-rose, fades; petals somewhat reflexed and twisted; free, but drooping much, on 6- to 10-inch stalks, above foliage.

Red on Yellow.

YANKEE KING (McRae).—5 feet. Flowers 5 to 6 inches; creamy-yellow, much suffused carrot-red; free, drooping, on 9- to 10-inch stalks, above foliage.

GENERAL MCRAE (McRae).—6 feet. Flowers 5 to 6½ inches; dull eugenia-red on pale cadmium-yellow; free, erect, on 6- to 12-inch stalks, not above foliage.

ROSE FALLON (McRae).—4½ feet. Flowers 4 to 5 inches; pinkish cinnamon flushed scarlet; free, drooping, on 6- to 12-inch stalks, above foliage.

Purple.

R. TREAT (McRae), A.M.—6 feet. Flowers 6 inches; rhodamine-purple passing to tyrian-rose at centre; free, erect, on 9- to 15-inch stalks, above foliage.

REV. S. MARRIOTT (Stredwick), H.C.—5½ feet. Flowers 6 to 8 inches; rich purple-carmine; free, erect, on 6- to 12-inch stalks, above foliage.

Rosy-scarlet.

LADY SNAGGE (Cheal), H.C.—5 feet. Flowers 5 inches; rosy-scarlet, tips paler; free, erect, on 9- to 16-inch stalks, well above foliage.

Orange-scarlet.

FANTASY (Stredwick), A.M.—6½ feet. Flowers 6 to 7½ inches; rich orange-scarlet, tips white; margins of petals recurved at the tips; free, erect, on 9- to 16-inch stalks, above foliage.

LUDWIG THOMA (R. A. Van der Schoot), H.C.—Described R.H.S. JOURNAL, vol. 54, p. 228.

Scarlet.

JERSEY'S BEACON (Ballego).—4½ feet. Flowers 6 to 7 inches; bright scarlet, margins and tips paler; free, drooping, on 12- to 18-inch stalks, above foliage.

MISS G. KENKEEL (Majoor), A.M.—Described R.H.S. JOURNAL, vol. 54, p. 228.

MRS. RAYMOND WARREN (Cheal).—6 feet. Flowers 4 to 5 inches; rich scarlet; free, erect, on 9- to 15-inch stalks, above foliage.

MINNIE HINDLEY (McRae).—4½ feet. Flowers 5 to 6½ inches; rich crimson-scarlet; free, drooping, on 6- to 10-inch stalks, not above foliage.

CLASS 9.

Small-flowered Decorative Dahlias.

AWARDS.

ONAH, A.M. August 29, 1929. Raised and sent by Messrs. J. Burrell.

BALDRE, A.M. August 29, 1929. Raised and sent by Messrs. J. Burrell.

STELLA, A.M. August 29, 1929. Raised and sent by Messrs. J. Burrell.

Yellow.

ONAH (Burrell), A.M.—3½ feet. Flowers 3½ to 4 inches; pinard-yellow somewhat flushed with orange; free, erect, on 6- to 10-inch stalks, well above foliage.

Pink.

STELLA (Burrell), H.C.—3½ feet. Flowers 3½ to 4 inches; bright rose-pink; petals somewhat channelled; free, erect, on 6- to 10-inch stalks, well above foliage.

ZUT (Burrell).—4 feet. Flowers 3½ inches; dull spinel-pink, centre darker; inner petals somewhat channelled; free, erect, on 6- to 12-inch stalks, well above foliage.

Rosy-red on Orange.

BALDRE (Burrell), A.M.—5 feet. Flowers 4 to 4½ inches; rosy-red on orange, centre darker; inner petals somewhat recurved; very free, erect, on 9- to 15-inch stalks, well above foliage. (Gold Medal, N.D.S., 1929).

Scarlet.

NINA (Burrell).—4 feet. Flowers 4 inches; rich scarlet, tips yellowish; free, erect, on 6- to 10-inch stalks, above foliage.

CLASS II.

*Camellia-flowered Dahlias.**White.*

MRS. DAVID INGAMILLS (Cheal).—4 feet. Flowers 4 inches ; white ; free, erect, on 6- to 12-inch stalks, well above foliage.

Red on Yellow.

MRS. LOOKER (Cheal).—4 feet. Flowers 4 inches ; tyrian-rose on lemon-yellow ; free, erect, on 6- to 14-inch stalks, well above foliage.

Rose-red.

MRS. DUNCAN CAMPBELL (Cheal).—6 feet. Flowers 4 inches ; bright rose-red ; free, erect, on 9- to 15-inch stalks, above foliage.

Scarlet.

MRS. CHARLES HAY (Cheal).—5½ feet. Flowers 4 inches ; rosy-scarlet, base of petals orange, fades ; free, erect, on 9- to 14-inch stalks, well above foliage.

MRS. LINDFORD (Cheal).—6 feet. Flowers 4 inches ; bright rich scarlet ; free, erect, on 6- to 14-inch stalks, well above foliage.

CLASS 14.

Star Dahlias.

AWARDS.

Hookwood Star, H.C. September 16, 1929. Raised and sent by Messrs. J. Cheal.

Rubin, H.C. August 29, 1929. Raised and sent by Messrs. J. Cheal.

Yellow.

GOLDEN STAR (Cheal).—5 feet. Flowers 3 to 3½ inches ; light greenish-yellow ; free, erect, on 6- to 14-inch stalks, well above foliage.

Pink.

HOOKWOOD STAR (Cheal), **H.C.**—4 feet. Flowers 3 inches ; amaranth-pink shading to white at centre ; free, erect, on 9- to 15-inch stalks, well above foliage.

Rose.

WARNHAM STAR (Cheal).—4½ feet. Flowers 3 to 3½ inches ; bright tyrian-pink, centre crimson ; free, erect, on 6- to 12-inch stalks, above foliage.

Red on Orange.

RUBIN (Cheal), **H.C.**—5 feet. Flowers 3 inches ; light jasper-red on orange, shaded crimson at base of each floret ; free, erect, on 9- to 12-inch stalks, well above foliage.

Rosy-red.

ROBERT (Cheal).—4½ feet. Flowers 3 inches ; deep tyrian-rose ; free, erect, on 9- to 15-inch stalks, well above foliage.

CLASS 15.

Cactus Dahlias.

AWARDS.

Early Yellow, A.M. August 29, 1929. Raised and sent by Messrs. Bruidegom of Baarn, Holland.

White Wonder, H.C. August 29, 1929. Raised and sent by Messrs. C. S. Weyers of Hillegom, Holland.

White.

WHITE WONDER (Weyers), **H.C.**—4½ feet. Flowers 6 inches ; white ; broadly quilled ; free, erect, on 9- to 18-inch stalks, well above foliage. A garden cactus variety.

PETER FROWD (Stredwick).—6 feet. Flowers 6 to 7½ inches; broadly quilled; ivory-white, centre ivory; free, flower drooping, on 9- to 16-inch stalks, above foliage. A garden cactus variety.

MRS. E. BRADLEY (Stredwick).—5 feet. Flowers 5 inches; white, centre ivory; free, erect, on 9- to 12-inch stalks, at first hidden by the foliage, afterwards above.

MENIN (Stredwick).—4½ feet. Flowers 6 to 7½ inches; broadly quilled; creamy white, centre pale cream; free, erect, on 6- to 10-inch stalks, just above foliage. A garden cactus variety.

Yellow.

MRS. A. W. PIPER (Stredwick).—5 feet. Flowers 6 to 7½ inches; broadly quilled; cream at tips of florets, passing to lemon at the base; free, drooping, on 9- to 15-inch stalks, at first hidden by the foliage, afterwards above. A garden cactus variety.

COKKIE CARLÉE (Carlée).—5 feet. Flowers 6 inches; broadly quilled; pale sulphur; free, erect, on 9- to 15-inch stalks, at first hidden by the foliage, afterwards above. A garden cactus variety.

EARLY YELLOW (Bruidegom), A.M.—5 feet. Flowers 6 inches; broadly quilled; bright lemon-yellow; free, erect, on 12- to 16-inch stalks, well above foliage. A garden cactus variety.

AUTUMN (Stredwick).—6 feet. Flowers 5 to 6 inches; amber-yellow; free, drooping, on 9- to 15-inch stalks, well above foliage.

Coral-red.

FIREFLY (Stredwick).—6½ feet. Flowers 5 to 6 inches; bright coral-red; free, drooping, on 9- to 15-inch stalks, above foliage.

CLASS II.

*Camellia-flowered Dahlias.**White.*

MRS. DAVID INGABELLS (Cheal).—4 feet. Flowers 4 inches ; white ; free, erect, on 6- to 12-inch stalks, well above foliage.

Red on Yellow.

MRS. LOOKER (Cheal).—4 feet. Flowers 4 inches ; tyrian-rose on lemon-yellow ; free, erect, on 6- to 14-inch stalks, well above foliage.

Rose-red.

MRS. DUNCAN CAMPBELL (Cheal).—6 feet. Flowers 4 inches ; bright rose-red ; free, erect, on 9- to 15-inch stalks, above foliage.

Scarlet.

MRS. CHARLES HAY (Cheal).—5½ feet. Flowers 4 inches ; rosy-scarlet, base of petals orange, fades ; free, erect, on 9- to 14-inch stalks, well above foliage.

MRS. LINDFORD (Cheal).—6 feet. Flowers 4 inches ; bright rich scarlet ; free, erect, on 6- to 14-inch stalks, well above foliage.

CLASS 14.

Star Dahlias.

AWARDS.

Hookwood Star, H.C. September 16, 1929. Raised and sent by Messrs. J. Cheal.

Rubin, H.C. August 29, 1929. Raised and sent by Messrs. J. Cheal.

Yellow.

GOLDEN STAR (Cheal).—5 feet. Flowers 3 to 3½ inches ; light greenish-yellow ; free, erect, on 6- to 14-inch stalks, well above foliage.

Pink.

HOOKWOOD STAR (Cheal), **H.C.**—4 feet. Flowers 3 inches ; amaranth-pink shading to white at centre ; free, erect, on 9- to 15-inch stalks, well above foliage.

Rose.

WARNEAM STAR (Cheal).—4½ feet. Flowers 3 to 3½ inches ; bright tyrian-pink, centre crimson ; free, erect, on 6- to 12-inch stalks, above foliage.

Red on Orange.

RUBIN (Cheal), **H.C.**—5 feet. Flowers 3 inches ; light jasper-red on orange, shaded crimson at base of each floret ; free, erect, on 9- to 12-inch stalks, well above foliage.

Rosy-red.

ROBERT (Cheal).—4½ feet. Flowers 3 inches ; deep tyrian-rose ; free, erect, on 9- to 15-inch stalks, well above foliage.

CLASS 15.

Cactus Dahlias.

AWARDS.

Early Yellow, A.M. August 29, 1929. Raised and sent by Messrs. Bruidegom of Baarn, Holland.

White Wonder, H.C. August 29, 1929. Raised and sent by Messrs. C. S. Weyers of Hillegom, Holland.

White.

WHITE WONDER (Weyers), **H.C.**—4½ feet. Flowers 6 inches ; white ; broadly quilled ; free, erect, on 9- to 18-inch stalks, well above foliage. A garden cactus variety.

PETER FROWD (Stredwick).—6 feet. Flowers 6 to $7\frac{1}{2}$ inches; broadly quilled; ivory-white, centre ivory; free, flower drooping, on 9- to 16-inch stalks, above foliage. A garden cactus variety.

MRS. E. BRADLEY (Stredwick).—5 feet. Flowers 5 inches; white, centre ivory; free, erect, on 9- to 12-inch stalks, at first hidden by the foliage, afterwards above.

MENIN (Stredwick).— $4\frac{1}{2}$ feet. Flowers 6 to $7\frac{1}{2}$ inches; broadly quilled; creamy white, centre pale cream; free, erect, on 6- to 10-inch stalks, just above foliage. A garden cactus variety.

Yellow.

MRS. A. W. PIPER (Stredwick).—5 feet. Flowers 6 to $7\frac{1}{2}$ inches; broadly quilled; cream at tips of florets, passing to lemon at the base; free, drooping, on 9- to 15-inch stalks, at first hidden by the foliage, afterwards above. A garden cactus variety.

COKKIE CARLÉE (Carlée).—5 feet. Flowers 6 inches; broadly quilled; pale sulphur; free, erect, on 9- to 15-inch stalks, at first hidden by the foliage, afterwards above. A garden cactus variety.

EARLY YELLOW (Bruidgom), A.M.—5 feet. Flowers 6 inches; broadly quilled; bright lemon-yellow; free, erect, on 12- to 16-inch stalks, well above foliage. A garden cactus variety.

AUTUMN (Stredwick).—6 feet. Flowers 5 to 6 inches; amber-yellow; free, drooping, on 9- to 15-inch stalks, well above foliage.

Coral-red.

FIREFLY (Stredwick).— $6\frac{1}{2}$ feet. Flowers 5 to 6 inches; bright coral-red; free, drooping, on 9- to 15-inch stalks, above foliage.

BEARDED IRISES TRIED AT WISLEY, 1928-29.

THIS report is a continuation of the First Report published in our JOURNAL, 58, pp. 116-160. The Irises still under trial were transplanted in 1927 and additions have been made from various sources since. The arrangement into classes is exactly as set out in the last report, and the Awards made on the recommendation of the Joint Committee of the Royal Horticultural Society and the Iris Society after many examinations of the plants are shown below.

The report also shows the varieties that have been added to or taken from the Standard Collection as well as those which still await judgment. Descriptions are given of all varieties added to the Standard Collection or to which awards have been made.

The Bearded Irises at Wisley are grouped in these two reports into four groups :

1. Varieties to which awards have been made after trial in the Garden.
2. Other varieties of considerable excellence but which up to now have not "scored" high enough to obtain an award, but which nevertheless can be generally recommended.
3. Varieties still awaiting judgment.

These three groups are planted together at Wisley arranged in their colour classes.

4. Varieties which for one reason or another are regarded as inferior garden plants, or now superseded by other varieties of the same colour class. These are planted in a separate part of the Garden, arranged also in their colour classes.

This report should be read in conjunction with the last.

AWARDS, NOTES, AND DESCRIPTIONS.

CLASS I. WHITE OR NEARLY WHITE VARIETIES.

No further awards have been made in this class.

To the Standard Collection is added :

CYGNET.—A vigorous plant of rapid increase, with glaucous-green foliage, 24-28 inches high. Flowering stems 42 inches, erect, usually 5-flowered. Flowers rather close on short branches above middle of zigzag stem, of medium size, well proportioned and stiff. Standards domed, $2\frac{3}{4} \times 1\frac{3}{4}$ inches. Falls drooping, $1\frac{1}{2} \times 1\frac{3}{4}$ inch. Falls and standards creamy white, the standards showing more cream, both veined brownish at base. Style arms and crest cream. Beard white, tipped orange. Flowering from June 10, 1929. Raised and sent by Miss Sturtevant, Wellesley, U.S.A. Introduced 1923.

The only new variety planted with the Standard Collection in this class for future judgment is :

SHASTA (Salbach).



FIG. 45.—IRIS 'BLUE CHINTZ.'

(p. 133)

[To face p. 132.]

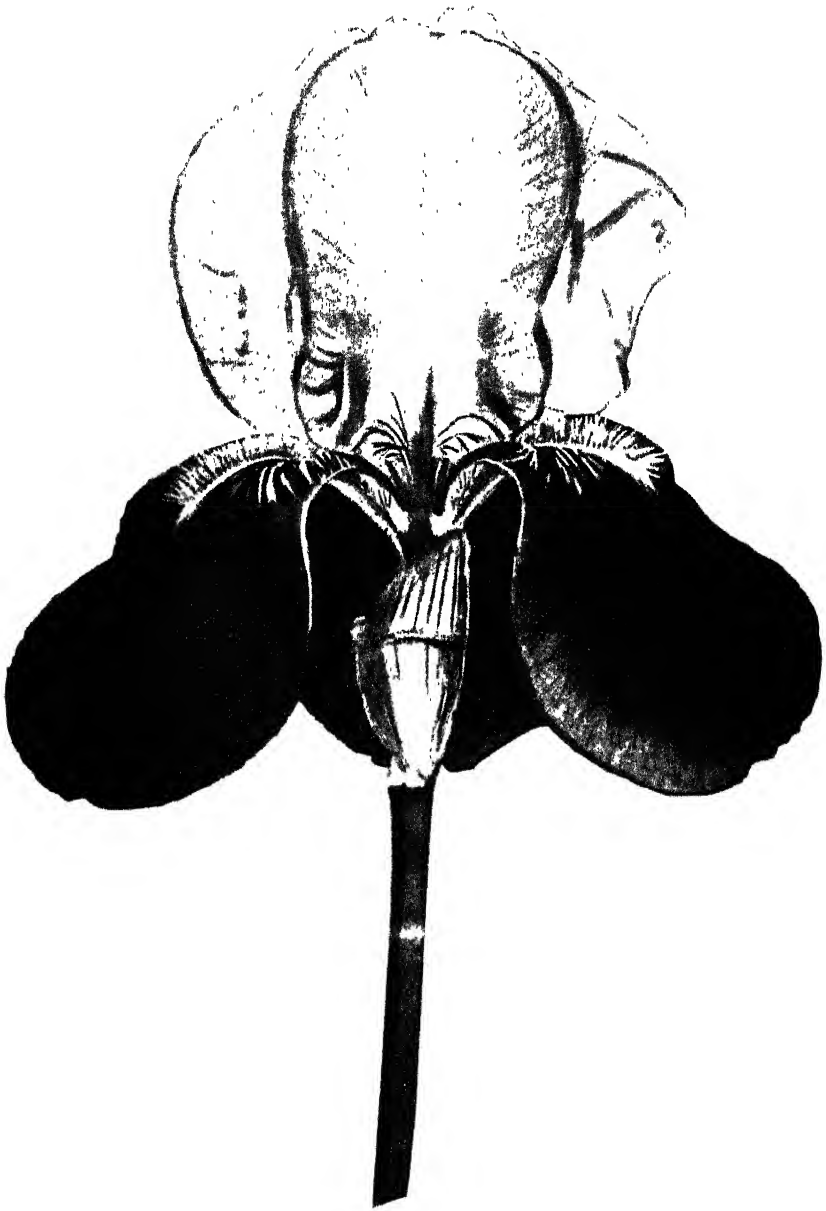


FIG. 46.—IRIS 'YEOMAN.'

(p. 134)

The following varieties listed as under further trial in the first Report are now relegated to the General Collection :

FLAVESCENS ALBA : 28 inches ; May-June.

IVORY : 26-30 inches ; June.

LEOTA : 26-28 inches ; May-June.

CLASS IIA a (1).

Varieties with blue-purple feathering confined to margins of segments which are otherwise white.

Blue Chintz, A.M. 1929. Vigorous, of rapid increase, with glaucous-green foliage, 24-26 inches. Flowering stems 36 inches, erect, 6-flowered. Flowers large, rather close, on short branches above middle of stem, well proportioned, stiff. Standards cupped, notched at tips, $2\frac{1}{2} \times 2$ inches. Falls drooping to straight-hanging, rather pinched, $1\frac{3}{4} \times 2$ inches. Both standards and falls suffused lavender-violet, especially towards margins, on white ground, distinctly veined on haft. Crest lavender-violet. Style arms with lavender-violet midrib. Beard white, tipped orange-bronze. Flowering for a fortnight from June 6, 1929. Raised and sent by Mr. Frank Burton, Roughetts, Hildenborough, Kent. Not yet introduced (Fig. 45).

TRUE CHARM.—Vigorous, of rapid increase, with erect glaucous-green foliage, 20 inches high. Flower stems 30 inches, erect, 6-flowered. Flowers of medium size, rather close on short branches on a zigzag stem, well proportioned, stiff. Standards cupped, $2\frac{1}{2} \times 2$ inches, tips notched, margins waved, white suffused and veined lavender. Falls straight-hanging, $1\frac{3}{4} \times 2\frac{1}{2}$ inches, broadly spatulate, white, margins veined lavender. Style branches and crest lavender-mauve. Beard white, tipped bright orange. Flowering for nearly three weeks from June 2, 1929. Raised and sent by Miss G. Sturtevant. Introduced 1920.

No varieties have been added in this class to those awaiting judgment.

CLASS IIA a (2).

The following varieties have been relegated to the General Collection :

ALETHA : 36 inches ; June.

PRINCESS TOTO : 25 inches ; June.

Classes IIA b (1) and IIA b (2) remain as in last Report.

CLASS IIB.

Varieties feathered purple on a yellow ground.

KING KARL.—Plant vigorous, of rapid increase with green foliage drooping at tips, 18 inches high. Flowering stems 24 inches, erect, 6-flowered. Flowers medium to large, very close, well proportioned and stiff. Standards somewhat domed, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, deep cream with faint mallow-purple flush on the deeper cream margins, base spotted brown. Falls drooping, $1\frac{3}{4} \times 2\frac{1}{2}$ inches, slightly pinched, creamy white, slightly speckled mallow-purple, margins deeper cream, veins on haft, distinct, brown. Style arms shaded mallow-purple on margin. Crest cream. Beard cream, tipped deep orange. Flowering for a fortnight from May 31, 1929. Raised and sent by Mr. Sass of Washington, Nebraska, 1926. (Mid-west \times variegata.)

CLASS IIIa.

Remains as in last report.

CLASS IIIb.

Standards white, falls suffused with purple all over.

DOROTHEA.—Plant vigorous, of rapid increase. Foliage green, 20 inches. Flowering stems 20-22 inches, erect, 3-flowered. Flowers of medium size, well proportioned, but inclined to be floppy. Standards cupped to domed, $2\frac{1}{2} \times 1\frac{3}{4}$ inch, white tinged lavender, veined deeper at base. Falls drooping, $1\frac{3}{4} \times 1\frac{1}{2}$ inch, dull lavender, streaked pale violet with brownish-black veins at

base. Style branches and crest white and pale lavender. Beard white, tipped orange. Flowering from May 9, 1929, for three weeks. Raised by Mr. Caparne in 1901 (A.M. 1916). An intermediate variety.

The following varieties have been relegated to the General Collection :

JULIETTE : 30 inches ; June.

THORA PERRY (Cengialti) : 24 inches ; June.

CLASS IVa.

Standards pale blue-purple, falls darker.

Rhein Traube, A.M. 1929. Very vigorous and of rapid increase, with erect glaucous-green foliage, 26 inches high. Flower stems rather zigzag, erect, 6-8-flowered. Flowers close, of medium size, well proportioned, but rather apt to flop. Standards cupped, $2\frac{1}{2} \times 2$ inches, pale lavender, greyish at base. Falls drooping, 2×2 inches, rich violet-blue, but pale at margins, veined distinctly on haft. Style branches and crest pale lavender. Beard white at base, orange tipped bronze above. Flowering for three weeks from June 6, 1929. Introduced by Messrs. Goos & Koenemann in 1917. Sent by Messrs. Waterer & Crisp (Fig. 47).

Sir Michael, A.M. 1929. Plant vigorous, of rapid increase, with erect glaucous-green foliage, 24 inches. Flower stems 38 inches, erect, 8-flowered, branching below middle. Flowers close, large, well proportioned and stiff. Standards somewhat cupped, $3\frac{1}{2} \times 2\frac{1}{2}$ inches, lavender-blue shaded bronze, bronzy yellow at base. Falls drooping, $2\frac{1}{2} \times 2\frac{3}{8}$ inches, rich velvety plum-purple with brownish haft. Crest and style arms lavender-blue on cream. Beard conspicuous, rich bright orange. Flowering for a fortnight from June 4, 1929. Raised by Mr. G. Yeld. Introduced 1925, and sent by the Orpington Nursery Co. This might well be placed in Class VIb on account of the yellow ground, but for garden effect it belongs to Class IVa.

Yeoman, A.M. 1929. For description, etc., see JOURNAL, 53, p. 126 (Fig. 46).

ANN PAGE.—Vigorous, of rapid increase, with glaucous-green erect foliage, 18 inches high. Flower stems 27 inches, erect, 6-flowered, branched. Flowers close, of medium size, well proportioned, stiff. Standards domed, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, lavender-violet. Falls drooping, $1\frac{1}{2} \times 2\frac{1}{2}$ inches, bluish violet, veined brownish-yellow at base. Beard white, tipped yellow. Flowering for three weeks from May 31, 1929. Raised by Sir Arthur Hort. Introduced by Messrs. Wallace of Tunbridge Wells in 1919. Sent by Mr. G. L. Pilkington (A.M. 1920).

PROSPERO.—Very vigorous and of rapid increase, with glaucous-green leaves 26 inches long, drooping at tips. Flower stems branching 36 inches, apt to droop under stress of weather, 8-9-flowered. Flowers closely spaced, large, well proportioned, but somewhat floppy. Standards domed, tips touching, $3 \times 2\frac{1}{2}$ inches, somewhat smoky lavender-violet. Falls straight-hanging, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, litho-purple, with brown veining on cream on haft. Style arms and crest pale violet. Beard white, tinged bright orange. Flowering for three weeks from June 8, 1929. Raised by Mr. G. Yeld. Sent by Messrs. Wallace. Near Class VIb. (A.M. 1920).

SYBILA.—Plant vigorous and of rapid increase, with glaucous-green foliage, 22 inches high. Flower stems 38 inches, branching, 6-flowered. Flowers large, well proportioned, stiff. Standards more or less domed, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, bright lavender. Falls drooping, $2 \times 2\frac{3}{8}$ inches, bright violet with paler margins, veined brown at base on white ground. Beard white, yellow in upper half. Flowering for ten days from June 4. Raised and sent by Mr. F. C. Stern, 1926. (Dominion \times Lord of June.)

The following varieties have been added for future judgment :

AZULADO (Pilkington).

MOUNT SERRAT (Wells).

EL CAPITAN (Salbach).

P2061 (Baker) dwarf variety.

JUNION (Burton).

RAMILAHs (Sadler).

MR. T. W. THORNTON (Bostock).

The following varieties have been relegated to the General Collection :

ECKESACHS : 34 inches ; June.

FAITH : 22 inches ; June.

FLORENTINE BLUE : 25 inches ; May.

HUBERT : 36 inches ; May-June.

IVANHOE : 24 inches ; June.

KOYA : 36 inches ; June.

MRS. W. E. FRYER : 22 inches ; June.

CLASS IVb.

Purple bicolor varieties with standards deep blue-purple.

Souvenir de Madame Gaudichau, F.C.C. 1929. For description and notes see JOURNAL, 53, p. 129.

Abdera, A.M. 1929. For description see JOURNAL, 53, p. 130 (Fig. 48).

Centurion, A.M. 1929. For description see JOURNAL, 53, p. 130.

India, A.M. 1929. Plant vigorous, of rapid increase, with erect glaucous-green foliage, 24 inches. Flower stems 36 inches, straight, erect, branching, 6-flowered. Flowers large, well proportioned, stiff. Standards domed, $3\frac{1}{2} \times 3$ inches, rich lavender-blue. Falls sigmoid, $3 \times 2\frac{1}{2}$ inches, rich velvety nigrosin-violet, veins distinct, brownish on haft. Crest brownish violet, beard very conspicuous, white in lower, yellow in upper half. Flowering for a fortnight from June 1, 1929. A bold variety withstanding windstorms. This Iris was entered as D 2 R (JOURNAL 53, p. 134) and was raised and sent by Mr. G. L. Pilkington, 1927. (Alcazar \times Lord of June.)

Lent A. Williamson, A.M. 1929. For description see JOURNAL, 53, p. 130.

MOUNT ROYAL.—Plant vigorous, of rapid increase, with glaucous-green erect foliage, 24 inches high. Flower stems 36 inches, erect, zigzag, branched, 6-8-flowered. Flowers large, well proportioned, stiff. Standards domed, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, bright clear pleroma-violet. Falls drooping, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, rich bright nigrosin-violet. Beard white, tipped dull orange. Flowering for nearly three weeks from June 2, 1929. Raised and sent by Mr. F. Cleveland Morgan of Montreal.

TIMUR.—Plant vigorous, of rapid increase, with glaucous-green erect foliage, 22 inches high. Flower stems 28 inches, erect, zigzag, 6-flowered. Flowers large, well proportioned, stiff. Standards domed, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, dull smoky yellow, suffused reddish mauve. Falls straight-hanging, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, wine-purple, with distinct veins on haft. Style and crest cream; beard dirty yellow, tipped bronze. Flowering from June 4 for a fortnight. Raised and sent by Miss Sturtevant, and introduced 1924. This variety might be placed in Class VIc 2, but its general effect is with Class IVb. (Ossian \times Valkyrie.)

The following varieties are now relegated to the General Collection :

PELOPIDAS : 32 inches ; June.

CENGIALTI THALIA : 25 inches ; May-June.

CLASS IVc.

Varieties with pale red-purple standards lighter than the falls.

Romola, A.M. 1929. For description see JOURNAL, 53, p. 132.

HOCHELAGA.—Plant vigorous, of rapid increase, with erect glaucous-green foliage, 22 inches high. Flower stems 36 inches, erect, branched, zigzag, 8-flowered. Flowers large, well proportioned, stiff. Standards domed, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, amparo-purple, bronzed at base. Falls drooping, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, phlox-purple, with distinct darker veins on haft. Style branches and crest amparo-purple on yellow; beard white in lower, yellow in upper half, tipped bronze. Flowering for over a fortnight from June 5, 1929. Raised and sent by Mr. F. Cleveland Morgan, 1927.

SWEET LAVENDER.—Habit of preceding. Flower of medium size, well proportioned, stiff. Standards cupped, almost circular, $1\frac{1}{4} \times 1\frac{1}{4}$ inches, light lavender-violet. Falls fairly drooping, $1\frac{1}{2} \times 1\frac{1}{2}$ inch, Mathew's purple, margins paler, veining distinct at base on whitish ground. Beard white, tipped bronzy-yellow. Flowering for a month from May 26, 1927. Raised by Mr. Bliss, sent by Messrs. Waterer, Sons & Crisp (1925). (See JOURNAL, 53, fig. 22.) (Madame Chereau \times Cordelia).

The following varieties have been added to this class for future judgment :

CUPAVO (Dykes).

IRIS 147A (Baker).

FRIEDA MOHR (Salbach).

The following varieties in this class have been relegated to the General Collection :

HOURLI : 36 inches ; June.

PROSPERITY : 38 inches ; June.

CLASS IVd.

Varieties with dark red-purple standards paler than the falls.

PEERLESS.—Of moderate vigour and rapid increase, with erect glaucous-green foliage. Flower stems 36 inches, with short branches above middle of stem, 6-flowered. Flowers close, large, well proportioned, stiff. Standards cupped, $3 \times 2\frac{1}{2}$ inches, dull rich amparo-purple with faint tinge of yellow at base. Falls straight-hanging, $2\frac{1}{2} \times 2\frac{3}{4}$ inches, deep rich velvety reddish-purple, with brownish veins at base. Beard very conspicuous, orange, tipped bronze. Flowering for three weeks from May 29, 1929. Raised by Mr. W. R. Dykes, introduced in 1924 and sent by the Orpington Nursery Co.

PIONEER.—Plant vigorous, of rapid increase, with green erect foliage, 24 inches high. Flower stems 36 inches, branched, erect, straight, 8-flowered. Flowers of medium to large size, well proportioned and stiff. Standards more or less domed, $2\frac{3}{4} \times 2\frac{5}{8}$ inches, rich petunia-violet. Falls straight-hanging, $2 \times 2\frac{1}{2}$ inches, deep rich petunia-violet with distinct veining on a pale ground at base. Beard white, tipped orange. Flowering for three weeks from May 27, 1929. Raised by Mr. Bliss, introduced and sent by Messrs. Wallace, 1925.

The following variety has been added to this class for future judgment :

AKBAR (Dykes).

The following varieties in this class have been relegated to the General Collection :

CENGIALTI KING GEORGE : 24 inches ; May-June.

EMILIE : 24 inches ; May-June.

MONSIEUR D. PERTHUIS : 42 inches ; June.

PLUTO : 25 inches ; June.

CLASS Va.

Varieties with standards and falls of the same shade of pale blue-purple.

Bluet, A.M. 1929. For description see JOURNAL, 53, p. 136 (Fig. 49).

Benbow, A.M. 1929. For description see JOURNAL, 53, p. 136.

Mlle. Yvonne Pelletier, A.M. 1929. For description and figure see JOURNAL, 53, pp. 97, 136.

Norma, A.M. 1929. For description see JOURNAL, 53, p. 136.

Pallida dalmatica, A.M. 1929. For description see JOURNAL, 53, p. 136.

Pallida, Shotsham var., A.M. 1929. A taller variety (44 inches) with rather smaller flowers than *Odoratissima*, which it otherwise closely resembles. Flowering from June 5, 1929, for over a fortnight. Sent by the Orpington Nursery Co.

ARIEL.—Foliage glaucous, 18 inches. Flower stems 24-27 inches, erect, zigzag with short branches, 4-flowered. Flowers of medium size, well proportioned, stiff, near *Odoratissima* in colour. Standards cupped, $2\frac{1}{2} \times 1\frac{1}{2}$ inches. Falls drooping, $1\frac{1}{2} \times 1\frac{3}{4}$ inch. Flowering from May 20, 1929, for three weeks. Raised and sent by the Orpington Nursery Co. Introduced 1924.

The following varieties have been added to this class for future judgment :

BELLORIO (Salbach).

GREY LADY (Pilkington).

The following varieties have been relegated to the General Collection :

GLOIRE DE HILLEGOM : 23 inches ; June.

HORIZON : 27 inches ; May-June.

ISIS : 32 inches ; June.

CLASS Vb.

Self-coloured varieties with deep blue-purple flowers.

Harmony, A.M. 1929. For description see JOURNAL, 53, p. 139.

Parc de Neuilly, A.M. 1929. For description see JOURNAL, 53, p. 139.

GOLDCREST.—Foliage erect, glaucous-green, 16 inches. Flower stems erect, 26-28 inches, with very short branches, 4-flowered. Flowers small, well proportioned, stiff, clear violet-blue. Standards domed, $2\frac{1}{2} \times 1\frac{1}{4}$ inch. Falls drooping, $1\frac{3}{4}$ inch long and broad. Beard conspicuous, white, tipped orange.

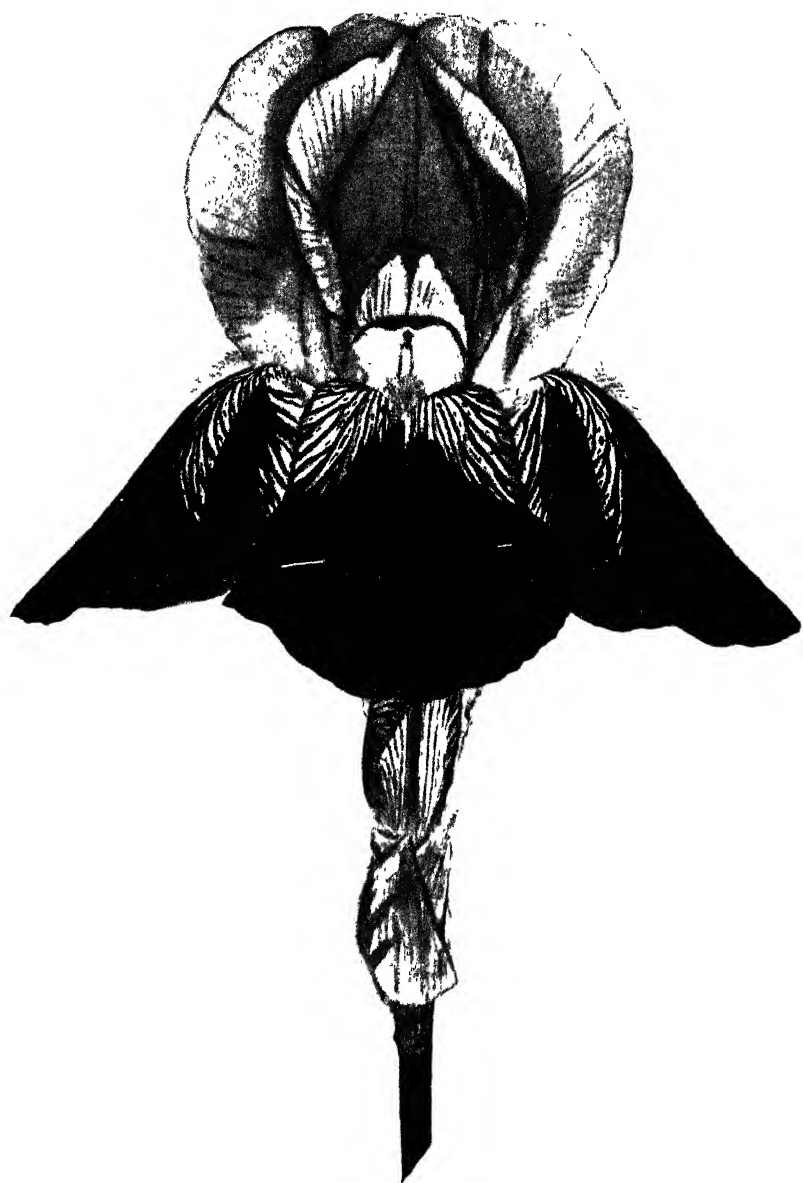


FIG. 47.—IRIS 'RHEIN TRAUBE.'

(p. 134)

[To face p. 136.

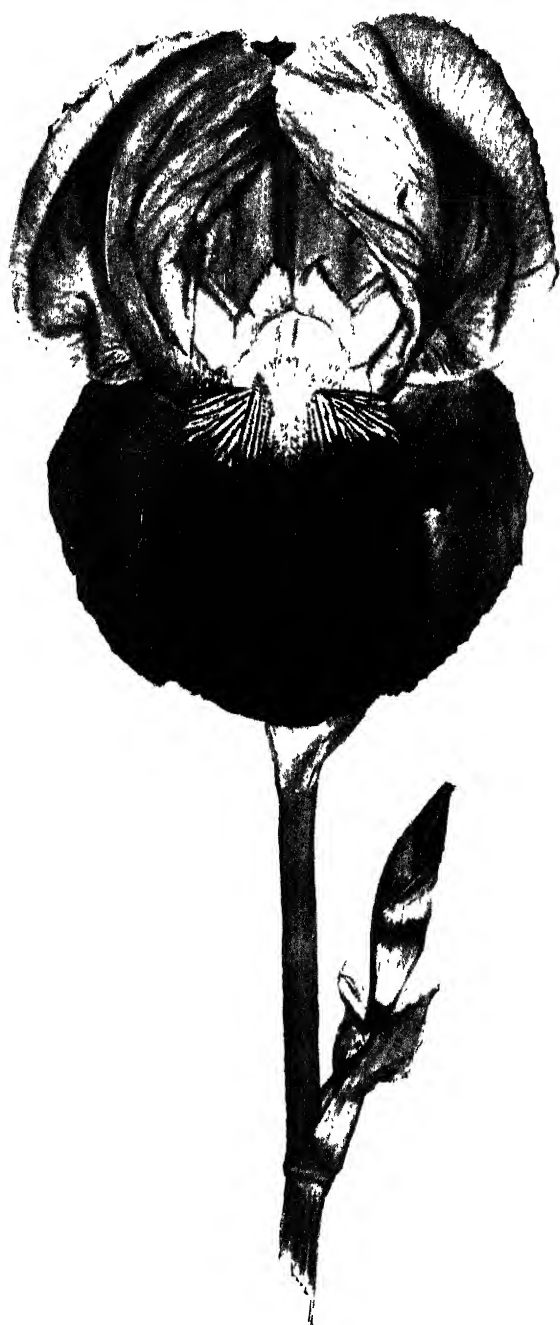


FIG. 48.—IRIS 'ABDERA.'
(p. 135)

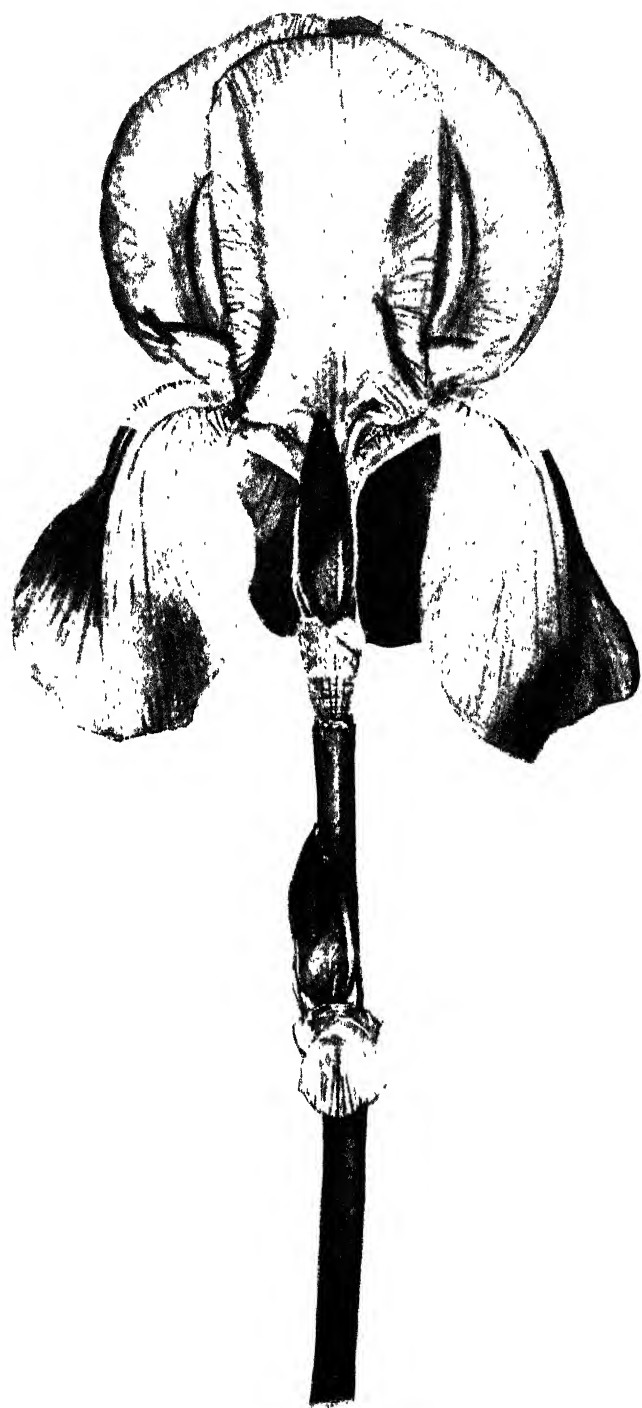


FIG. 49.—IRIS 'BLUET.'

(p. 136)

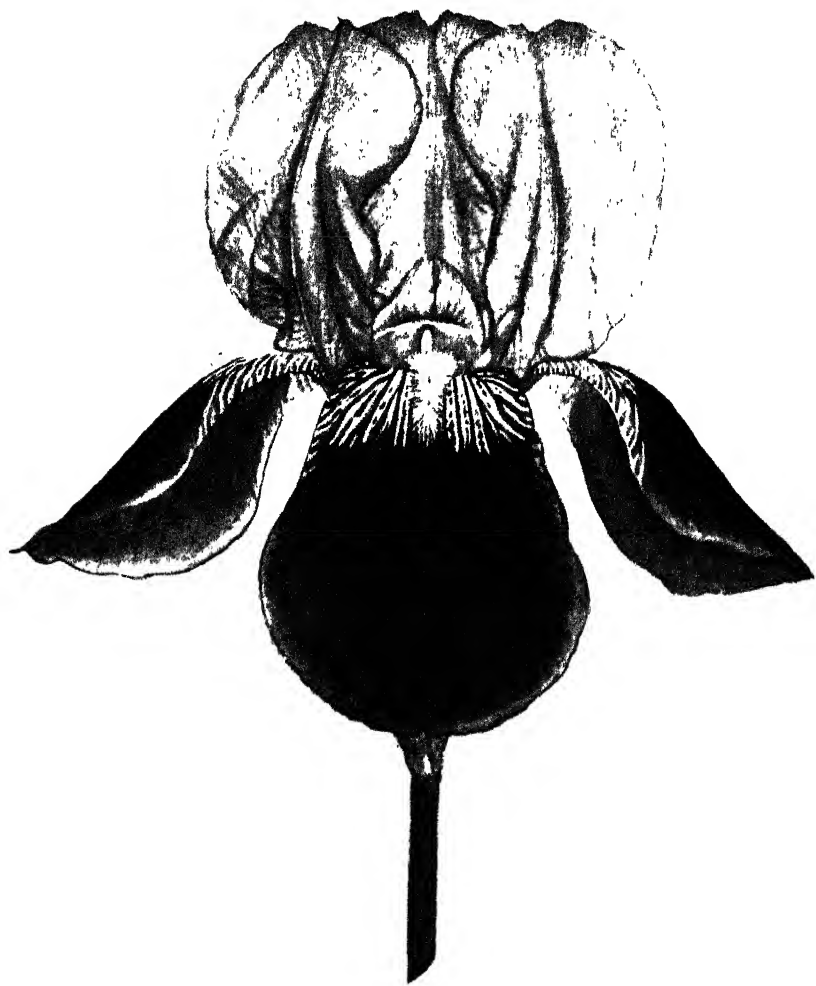


FIG. 50.—IRIS 'BRUNO.'
(p. 138)

Flowering from May 28, 1929, for a fortnight. Raised by Mr. W. R. Dykes. Introduced by the Orpington Nursery Co. 1914, and sent by them. (A.M. 1914.)

SAPPHIRE.—Of moderate vigour and rapid increase, with erect glaucous-green foliage, 12 inches high. Flower stems erect, somewhat zigzagged, 18 inches, 5-flowered. Flowers of medium size, well proportioned, stiff, deep rich bluish-violet, falls rather darker. Standards cupped, $2\frac{1}{2} \times 1\frac{1}{2}$ inch. Falls straight-hanging, $1\frac{1}{2} \times 1\frac{1}{2}$ inch. Beard conspicuous, white, tipped bright orange. Flowering for three weeks from May 23, 1929. Raised by Mr. W. R. Dykes. Introduced by the Orpington Nursery Co. 1922, and sent by them.

There are no additions to this class.

The following varieties in this class have been relegated to the General Collection :

GLADYS ROBERTS : 27 inches ; May-June.

OPORTO : 33 inches ; May-June.

PEDRO : June.

PURPLE LACE : 36 inches ; June.

CLASS Vc.

Self-coloured varieties with falls and standards pale red-purple.

Aphrodite, A.M. 1929. Vigorous and of rapid increase, with erect glaucous-green foliage, 20 inches high. Flower stems 36-40 inches, erect, with medium branches, 8-flowered. Flowers of medium size, well proportioned and stiff, deep Chinese violet in standards, pale Mathew's purple in falls. Standards domed, $2\frac{1}{2} \times 2\frac{1}{2}$ inches. Falls drooping, $2 \times 2\frac{1}{2}$ inches. Beard white, tipped bright yellow. Flowering for over three weeks from May 28, 1929. Raised by Mr. W. R. Dykes. Introduced by the Orpington Nursery Co. 1922, and sent by them.

Mrs. Marlon Cran, A.M. 1929. Habit of last. Flower stems 7-flowered. Flowers of medium size, well proportioned and stiff. Standards domed, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, light amparo-purple. Falls drooping, $1\frac{1}{2} \times 2$ inches, dull phlox-purple. Beard white, tipped bright orange. Flowering for over three weeks from May 27, 1929. Raised and sent by Mr. Amos Perry, who introduced the variety in 1923.

The following varieties have been planted in this class for future judgment :

DOG ROSE (Insole).

IRIS 147B (Baker).

IRIS SEEDLING (Insole).

The following varieties in this class have been relegated to the General Collection :

BRIONENSIS : 26 inches ; May-June.

FRANKLIN BEYNON : 34 inches ; May-June.

MAIDEN'S BLUSH : 32 inches ; June.

WYNHAM : 27 inches ; May-June.

CLASS Vd.

Varieties with deep red-purple self-coloured flowers.

The following variety has been added to this class for future judgment :

BOUREM (Cayeux).

CLASS VIa (1).

Varieties with standards of shot shades, pale blue or lavender, the yellow scarcely perceptible.

Hemodus, A.M. 1929. For description see JOURNAL, 53, p. 142.

Nemoralla, A.M. 1929. Plant vigorous, of rapid increase, with erect glaucous-green foliage, 30 inches high. Flower stems 38 inches, erect, with short branches, 7-flowered. Flowers of medium size, well proportioned and stiff. Standards cupped, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, pale lavender-violet, shot smoky bronze. Falls straight-hanging, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, lavender-violet with paler margins and coppery-brown veins on haft. Beard white, tipped orange. Flowering for three weeks from May 28, 1929. Raised and sent by Mr. Amos Perry (1925). Might, for garden effect, be placed in Class Va.

QUAKER LADY.—Foliage glaucous, erect, 24 inches high. Flower stems 36 inches, erect, with short branches, 8-flowered. Flowers of medium size, well proportioned, stiff. Standards arched, $1\frac{1}{2} \times 1\frac{1}{2}$ inch, dull copper, tinged lilac, with yellow base. Falls drooping, $1\frac{1}{2} \times 1\frac{1}{2}$ inch, Chinese violet with bronzy margins and coppery-yellow base. Crest amber; beard conspicuous, bright orange. Flowering for three weeks from May 29, 1929. Raised by Mr. Farr. Introduced in 1909. Sent by Messrs. Lowe & Gibson.

The following varieties have been added to this class for future judgment :

NIMBUS (Shull).

IRIS P462 (Baker) (dwarf).

CLASS VIa (2).

Varieties with standards of shot shades, rose or pale pink, the yellow being scarcely perceptible.

The following variety has been added to this class for future judgment :

ROMANCE (Orpington Nursery Co.).

CLASS VIb.

Varieties with bronze standards.

ARLINGTON.—Foliage erect glaucous-green, 24 inches. Flower stems 36 inches, branching, 8-flowered. Flowers large, well proportioned, stiff. Standards domed, $2\frac{1}{2} \times 2$ inches, dull smoky lavender-violet with a yellowish base. Falls drooping, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, petunia-violet with paler margins and with brownish veins on haft. Beard white below, upper half yellow, tipped bronze. Flowering for over a fortnight from June 2, 1929. Raised by Mr. H. P. Simpson of Rosslyn, Virginia, U.S.A. Introduced by Miss Sturtevant 1924, and sent by the Orpington Nursery Co. This variety was placed in Class IVd at first, but fits better here.

The following variety is in this class for further trial :

HAMDOILLAH (Baker).

CLASS VIc (1).

Varieties with standards in which yellow is obvious, purple predominating.

Bruno, A.M. 1929. For description see JOURNAL, 58, p. 145 (Fig. 50).

Lord Lambourne, A.M. 1929. Plant vigorous, of rapid increase. Foliage glaucous-green, erect, 24 inches high. Flower stems 36 inches, erect, straight, 8-flowered. Flowers of medium to large size, well proportioned, stiff. Standards cupped, $2\frac{1}{2} \times 2\frac{1}{2}$ inches, light perilla-purple, smoky, tinged yellow at base. Falls straight-hanging, $1\frac{1}{2} \times 1\frac{1}{2}$ inch, bright dahlia-carmine with paler margins, base yellowish. Beard white, tipped orange. Flowering for three weeks from May 21, 1929. Raised and sent by Mr. Amos Perry. Introduced 1922. (Pallida \times aurea.) (Fig. 51.)

ILSAN.—Very vigorous and rapid of increase, with glaucous-green erect foliage, 25 inches. Flowering stems 30 inches, erect, zigzagged, with very short branches and 8 crowded flowers. Flowers of medium size, well proportioned, stiff. Standards domed, $2\frac{1}{2} \times 1\frac{1}{2}$ inch, bright smoky plum-purple on bronze-yellow. Falls drooping, $1\frac{1}{2} \times 1\frac{1}{2}$ inch, rich velvety dahlia-purple with distinct veining below beard and on haft. Beard conspicuous, orange, tipped bronze. Flowering for a fortnight from June 8, 1929. Introduced by Goos & Koenemann 1920, and sent by Messrs. Waterer, Sons & Crisp.

Sikh.—Nearly resembling BRUNO but differing in size of spathes and some other small details, the standards and falls being somewhat longer and slightly narrower. Raised by Mr. G. P. Baker and sent by him. (Dominion \times M. Boyer.)

STEEPWAY.—Foliage erect glaucous-green, 24 inches. Flower stems with short branches, erect, 32 inches. Flowers of medium size, well proportioned, stiff. Standards cupped, $2\frac{1}{2} \times 2$ inches, deep hellebore-red, shaded bronze. Falls drooping, $1\frac{1}{2}$ inch long and broad, magenta with hellebore-red margins and distinct brownish veining on haft. Beard very conspicuous, rich orange. Flowering for nearly three weeks from June 1, 1929. Sent by Mr. A. H. Scott, Media, Philadelphia, U.S.A.

The following variety has been added to this class for future judgment :
GLOAMING (Orpington Nursery Co.).

The following varieties in this class are relegated to the General Collection :
FRYER'S GLORY : 28 inches ; June.
NERO : 42 inches ; May-June.

CLASS VIc (2).

Varieties with purple and yellow shaded standards, the yellow predominating.

Iris King, A.M. 1929. For description see JOURNAL, 53, p. 146.

Mrs. H. F. Bowles, A.M. 1929. For description see JOURNAL, 53, p. 146.

FRA ANGELICO.—Foliage erect glaucous-green, 24 inches high. Flowering stems 30 inches, branched, 6-flowered. Flowers of medium size, well proportioned, stiff. Standards cupped, $2\frac{1}{2} \times 2\frac{1}{4}$ inches, old gold, bronzy at base. Falls straight-hanging, $2 \times 2\frac{1}{4}$ inches, lilac, with dull cream margins, veining on haft. Beard yellow, tipped orange. Flowering for over a fortnight from June 5, 1929. Raised by Messrs. Vilmorin-Andrieux, 1919, and sent by them.

The following varieties have been added to this class for future judgment :

ALLURE (Orpington Nursery Co.).

PERSIA (Ayres).

RAMELDO (Mohr).

STORM (Orpington Nursery Co.).

IRIS 68 (G. P. Baker).

The following varieties belonging to this class have been relegated to the General Collection :

BELLE CHÂTELAINE : 20 inches ; June.

TANCRED : 32 inches ; June.

TECUMSETTE : 34 inches ; May-June.

CLASS VIIa.

Varieties with pale yellow standards, and falls with colour confined to the veins.

The following variety has been relegated to the General Collection :

GRACCHUS : 24 inches ; May-June.

CLASS VIIb.

Varieties with yellow standards and fall colour confluent.

W. J. FRYER.—Foliage glaucous-green, erect, 26 inches. Flower stems 36 inches, erect, branches long, 6-flowered. Flowers large, well proportioned, stiff. Standards arched, $2\frac{1}{2} \times 1\frac{1}{4}$ inch, dull smoky pale gold. Falls drooping, $1\frac{1}{2} \times 1\frac{1}{2}$ inch, dull deep chestnut-brown. Beard conspicuous, orange. Flowering for a fortnight from June 10. Raised (1917) and sent by Mr. W. E. Fryer of Mantorville, Minnesota, U.S.A., 1927.

CLASS VIIc.

Varieties with dark yellow standards, and falls with shade of purple confined to the veins.

Rialgar, A.M. 1929. Plant vigorous and of rapid increase. Foliage erect glaucous-green, 18 inches. Flower stems 21 inches, erect, straight, with 6 crowded flowers. Flowers of medium size, well proportioned, stiff. Standards cupped, $2\frac{1}{2} \times 1\frac{1}{4}$ inch, bright clear lemon-chrome. Falls drooping, $2 \times 1\frac{1}{2}$ inch, lemon-chrome with brownish-yellow veins. Beard conspicuous, yellow, tipped orange. Flowering for nearly three weeks from May 25. Raised and sent by Miss Sturtevant. Introduced 1924. (Prosper Laugier \times Wanayanda.)

The following variety has been relegated to the General Collection :

PRINCE FREDERICK : 22 inches ; June.

CLASS VII*d*.

Varieties with dark yellow standards, and falls suffused with blue-, red-, or brown-purple.

Flaming Sword, A.M. 1929. For description see JOURNAL, 53, p. 149 (Fig. 52.)

The following varieties have been added to this class for future judgment :

JOAN CURTIS (Perry).
TASMANIA (Pilkington).

The following varieties have been relegated to the General Collection :

ANTINOUS : 26 inches ; June.
HONORABLE : 25 inches ; June.

CLASS VIII*a*.

Varieties with dark yellow standards and yellow falls.

Gold Imperial, A.M. 1929. Plant vigorous, of rapid increase, with foliage drooping at tips, 24 inches, glaucous-green. Flowering stems 28-32 inches, erect, 6-flowered, straight. Flowers of medium size, well proportioned and stiff. Standards cupped, $2\frac{1}{4} \times 1\frac{1}{2}$ inch, clear pinard-yellow. Falls drooping, $1\frac{1}{2} \times 1\frac{1}{2}$ inch, clear cream with darker veins. Beard very conspicuous, orange. Flowering for a fortnight from June 12, 1929. Raised and sent by Miss Sturtevant, 1927. [(Hector \times Caterina) \times S. H. White.]

MONTEZUMA.—Foliage erect glaucous-green, 18-20 inches. Flowering stems erect, with short branches and 6 crowded flowers. Flowers of medium size, well proportioned, stiff. Standards arched, $2 \times 1\frac{3}{8}$ inch, primrose-yellow, with brownish veins near base. Falls horizontal to drooping, $1\frac{1}{2} \times 1\frac{1}{2}$ inch, deep cream, irregularly veined dark brown. Beard conspicuous, orange. Flowering for a fortnight from June 12. Raised by Mr. B. H. Farr of Wyomissing, U.S.A. Introduced 1909. Sent by the Orpington Nursery Co.

The following varieties have been added to this class for future judgment :

CANADIAN GOLD (Viscountess Byng).
BRITONESS (Dykes).
KENYA (Pilkington).
MANITOBA (Pilkington).
SUNBEAM (Orpington Nursery Co.).

CLASS VIII*b*.

Varieties with pale yellow standards and yellow falls.

Flutterby, A.M. 1929. For description see JOURNAL, 53, p. 151.

The following varieties have been added to this class for future judgment :

DAFFODIL (Orpington Nursery Co.).
MOONBEAM (Orpington Nursery Co.).
PRIMAVERA (Mohr).

The following variety has been relegated to the General Collection :

BRUNETTE : 16 inches ; May.

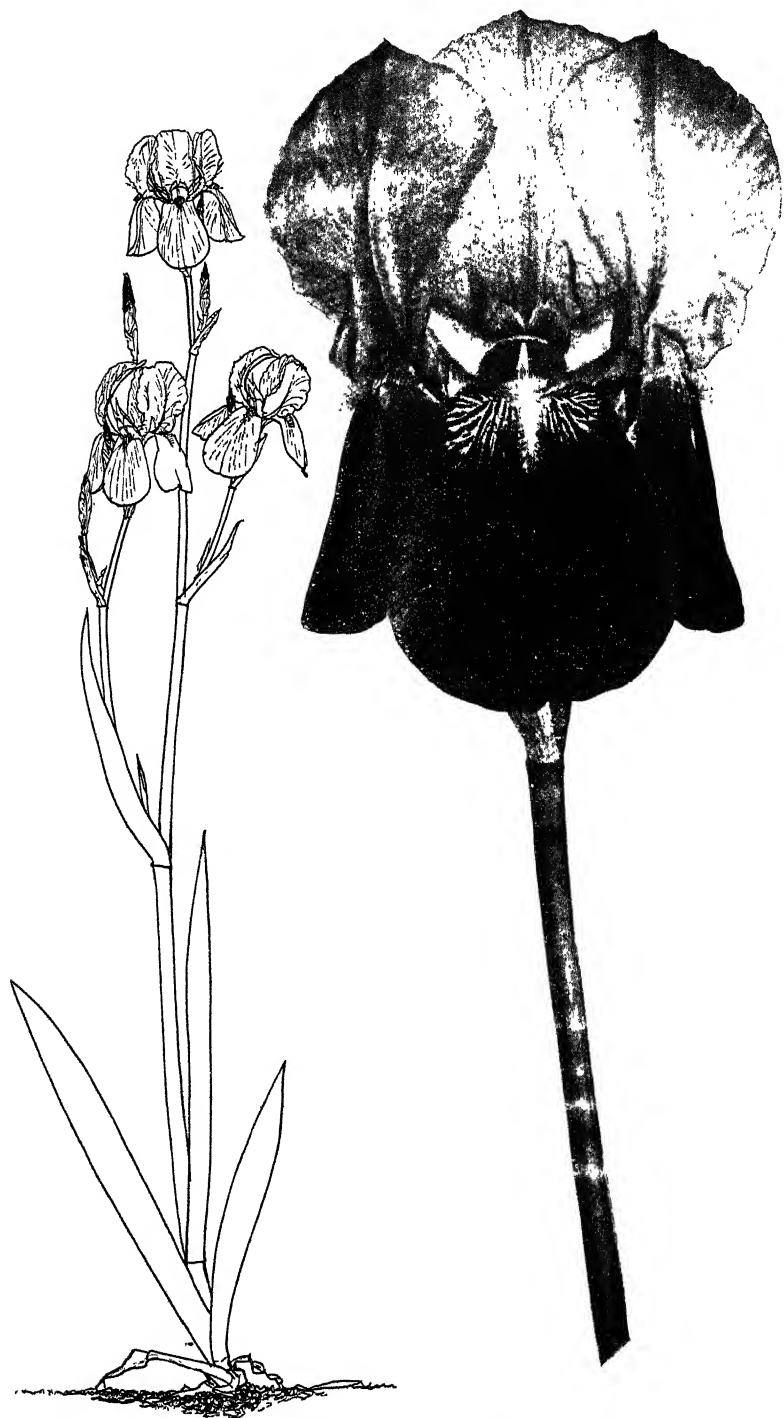


FIG. 51.—IRIS 'LORD LAMBOURNE.'

(p. 138)

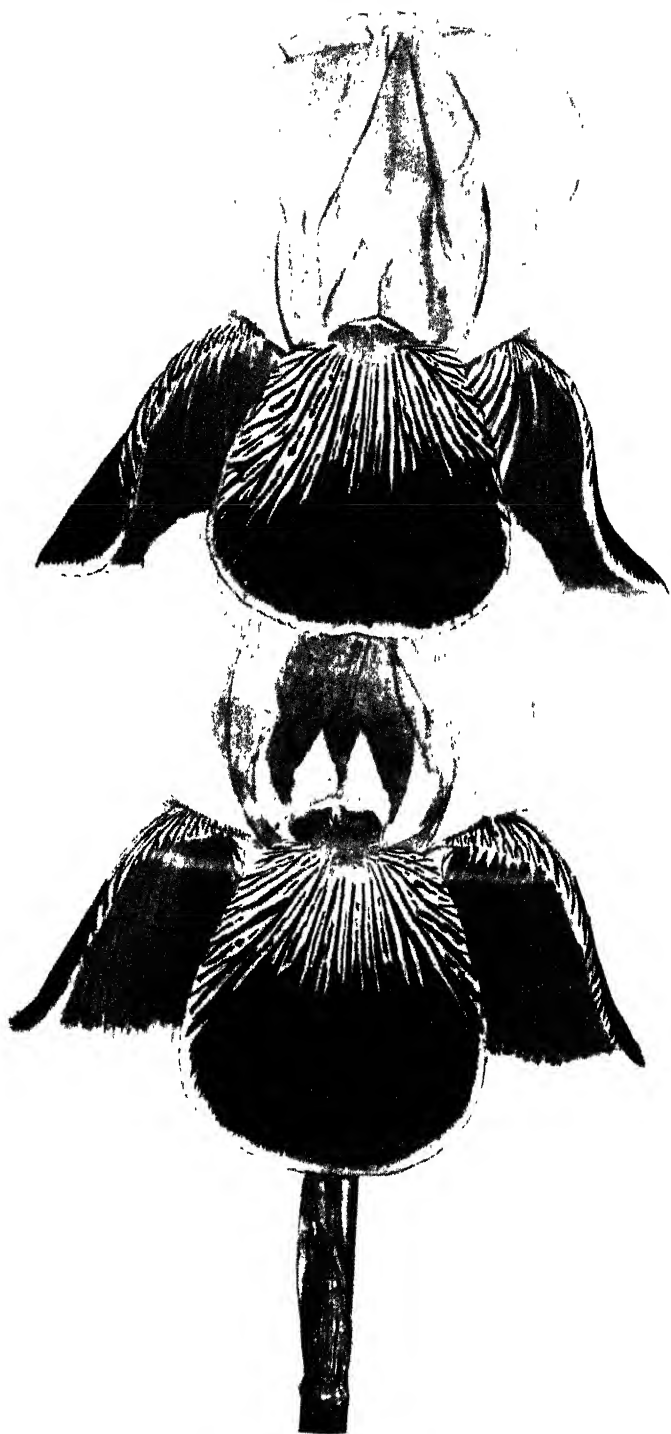


FIG. 52.—IRIS 'FLAMING SWORD.'

(p. 140)

[To face p. 141.

GAILLARDIAS TRIED AT WISLEY, 1929.

THE genus *Gaillardia* is a small one, native in North America and the more temperate parts of South America. It comprises both annual and perennial species, but of the latter some are not sufficiently hardy to withstand our winters and are best grown as annuals. Those perennial in British gardens have been derived from *Gaillardia aristata*, a species introduced from the United States in 1812 (figured in the *Bot. Mag.* t. 2940); while those grown as annuals are from *G. amblyodon* (an annual in its native Texas), which is usually late in coming into flower and which has given rise to few variations (see *Bot. Mag.* t. 6081), and from *G. pulchella* (*Bot. Mag.* t. 1602, under the name *G. bicolor*), which has given rise to many, both single and double. Of these varieties *Lorenziana* has the ray and sometimes the disc florets developed into tubular funnel-shaped florets with three to five lobes, *picta* (see *Bot. Mag.* t. 3368 and t. 3551, under the name *G. bicolor Drummondii*) differs in colour from that first figured, and *nana* is of dwarf habit. Of each of these there are colour-varieties.

Most of the perennial varieties noted came to Wisley as plants and were planted out, in clumps of three, 2 feet apart. They soon covered the allotted space, and flowered from June 18. There were twenty-six stocks, of which three came as seeds. One variety, 'Progression,' died, and one stock of seed failed, and these are not further referred to.

The Floral Committee judged the trial on July 25 and also on August 19.

The annuals (thirty-nine stocks) were sown in "60" pots, a few seeds in each pot, on April 12, the seedlings being reduced to one in each pot. They were planted out on June 18 in rows 18 inches apart, each plant being allowed 12 inches. Thirty plants of each stock were grown, and flowering commenced at the end of August and continued into November. Judging took place on September 6.

AWARDS, DESCRIPTIONS, AND NOTES.

PERENNIAL VARIETIES.

Yellow selfs.

AWARD.

Gloria, H.C. July 25, 1929. Raised and sent by Messrs. B. Ladhams of Shirley Nurseries, Southampton.

MRS. SHERBROOK (Stokes).—Plant fairly compact, 12 to 18 inches high, erect; flowers 3 inches diameter, clear lemon-yellow; disc $1\frac{1}{2}$ inch, orange-yellow.

GLORIA (Ladhams), H.C.—Plant compact, stems 12 inches, erect; flowers $2\frac{1}{2}$ inches diameter, clear rich lemon-yellow; disc $1\frac{1}{2}$ inch, reddish-brown.

GOLDEN QUEEN (Kelway).—Plant compact; flower stems 12 inches, weak; flowers 3 inches diameter, rich deep lemon-yellow; disc $1\frac{1}{2}$ inch, reddish-brown.

Orange, centre scarlet.

MONARCH OF ALL (Kelway).—Plant fairly compact, stems 18 inches, inclined to droop; flowers $3\frac{1}{2}$ inches, semi-double, rich orange, shaded scarlet towards the disc; disc $1\frac{1}{4}$ inch, reddish-brown. Also sent by Messrs. Kelway as 'Tangerine' (see below).

Flowers orange-shaded scarlet.

AWARD.

Tangerine, H.C. August 19, 1929. Raised by Mr. J. A. Christie and sent by Messrs. Barr of King St., Covent Garden, W.C., and Messrs. Daniels of Norwich.

TANGERINE (Barr, Daniels), **H.C.**—Plant compact, stems 12 to 15 inches, erect; flowers 3 inches diameter, dull orange-shaded scarlet; petals broad; disc $1\frac{1}{2}$ inch, reddish-brown.

Coppery crimson-scarlet.

BREMEN (Benary).—Plant fairly compact, stems 9 to 12 inches, erect; flowers $2\frac{1}{2}$ inches diameter, rich deep coppery crimson-scarlet, tipped yellow; disc $1\frac{1}{2}$ inch, reddish-brown.

Reddish-carmine broadly edged cream.

AWARD.

Rownham's Queen, H.C. July 25, 1929. Raised and sent by Messrs. B. Ladhams.

ROWNHAM'S QUEEN (Ladhams), **H.C.**—Plant compact, stem 10 inches, erect, stiff; flowers $2\frac{1}{2}$ inches diameter, reddish-carmine, cream edge to middle; disc 1 inch, reddish-brown.

MRS. BERKART (Kelway).—Plant compact, stems 15 to 20 inches, erect; flowers 3 inches diameter, carmine-crimson, deep cream edge to middle; disc $1\frac{1}{2}$ inch, reddish-brown.

Crimson edged yellow.

AWARD.

Maximum Triumphans, H.C. July 25, 1929. Raised and sent by Messrs. B. Ladhams.

BRILLIANT (Ladhams).—Plant compact, stems 10 to 12 inches, stiff; flowers $2\frac{1}{2}$ inches diameter, crimson at centre for $\frac{1}{3}$, outer zone chrome-yellow; disc 1 inch, reddish-brown.

MRS. BATEMAN BROWN (Barr).—Compact, stems 9 to 12 inches; flowers 3 to $3\frac{1}{2}$ inches diameter, zoned crimson-scarlet at middle for $\frac{1}{2}$, outer zone cadmium-yellow; disc $1\frac{1}{2}$ inch, reddish-brown.

IDEAL (Barr).—Very similar to the last, but flowers of a paler yellow and of a somewhat duller shade.

MOWBRAY MONARCH (Gibson).—Habit compact; flower stems 10 to 12 inches; flowers $2\frac{1}{2}$ inches diameter, zoned crimson at centre, pale towards middle of petals, outer zone of lemon-yellow to middle of petals; disc $1\frac{1}{2}$ inch, reddish-brown.

GUSTAVE REGIS (Barr).—Plant compact, stems stiff, 12 to 14 inches; flowers $2\frac{1}{2}$ to 3 inches diameter, outer zone cadmium-yellow to middle of petals, then scarlet passing to crimson at disc; disc $1\frac{1}{2}$ inch, reddish-brown.

MRS. J. M. MCKELLAR (Barr, Stokes).—Plant compact, stems stiff, erect, 12 to 15 inches; flowers $2\frac{1}{2}$ to 3 inches diameter, outer zone cadmium-yellow for $\frac{1}{2}$ length of petals, inner zone crimson; disc $1\frac{1}{2}$ inch, reddish-brown.

AURORA (Ladhams).—Habit of the last; stems 12 inches; flowers 3 inches diameter, inner zone deep reddish-carmine, tipped cadmium-yellow for $\frac{1}{2}$ length of petals; disc $1\frac{1}{2}$ inch, chestnut.

MAXIMUM TRIUMPHANS (Ladhams), **H.C.**—Plant very vigorous, compact, stems stiff, erect, 12 to 15 inches; flowers 3 to $3\frac{1}{2}$ inches diameter, tipped cadmium-yellow for $\frac{1}{2}$ length of petals, zoned scarlet shading to crimson at disc; disc $1\frac{1}{2}$ inch, reddish-brown.

GRANDIFLORA PORTOLA HYBRIDA (Waller-Franklin).—Plant spreading; stems 12 to 18 inches; flowers 3 to $3\frac{1}{2}$ inches diameter, with two rows of florets, tipped bright cadmium-yellow, zoned orange-scarlet for three parts; disc $1\frac{1}{2}$ inch, reddish-brown. Variable in shade. Raised from seed.

DAZZLER (R. Veitch).—Like the last. Raised from seed.

FLAMING SUN (Gibson).—Plant compact; stems 10 to 12 inches; flowers $2\frac{1}{2}$ inches diameter, tipped cadmium-yellow, zoned for three parts scarlet shading to crimson at disc; disc 1 inch, chestnut.

TAPLOW RED (Barr).—Habit of the last; flower stems 9 inches; flowers $2\frac{3}{4}$ inches diameter, tipped cadmium-yellow, zoned for three parts crimson-scarlet; disc $1\frac{1}{2}$ inch, reddish-brown.

MASTERPIECE (Barr).—Habit of the last; flowers $2\frac{1}{2}$ to $2\frac{3}{4}$ inches, tipped cadmium-yellow, zoned for $\frac{2}{3}$ crimson-scarlet, petals tubular; disc $1\frac{1}{2}$ inch, reddish-brown.

ANNUAL VARIETIES.

SINGLE.

Yellow.

PICTA AUREA (Benary, Dobbie).—20 inches; flowers 2 to $2\frac{1}{2}$ inches diameter, primuline-yellow; disc $\frac{3}{4}$ inch, greenish-yellow. Contained bicolor rogues.

BRIGHT YELLOW (Watkins & Simpson) } Like the last. Contained bicolor
PICTA YELLOW (Waller-Franklin) } rogues.

Rosy-carmine, tips dull white.

AWARD.

Chocolate Red, Cream Margin, H.C. September 16, 1929. From Messrs. Sutton & Sons of Reading.

PICTA ALBA MARGINATA (Benary, Waller-Franklin, Dobbie).—18 inches; flowers 2 to $2\frac{1}{2}$ inches diameter, dull rosy-carmine, broadly edged dull white; disc $\frac{3}{4}$ inch diameter, reddish-brown. Stocks variable in colour.

CHOCOLATE RED, CREAM MARGIN (Sutton), **H.C.**—A true stock of the last.

Bright scarlet, yellow at centre and tips.

PICTA CHAMELEON (Morris, Dobbie, Waller-Franklin).—16 inches; flowers 2 inches diameter; variable shades of bright scarlet tipped cadmium-yellow, lemon-yellow around disc; disc $\frac{3}{4}$ inch, at first greenish-yellow, later brownish. The first stock contained double rogues.

HARLEQUIN (Sutton).—Like the last.

Crimson-carmine, tips cadmium-yellow.

AWARD.

Picta Josephus, H.C. September 16, 1929. Sent by Messrs. E. Benary of Erfurt, Germany.

PICTA FULCHELLA (Dobbie).—18 inches; flowers 2 to $2\frac{1}{2}$ inches, dull crimson-carmine, tipped cadmium-yellow; disc $\frac{3}{4}$ inch, reddish-brown. Variable in colour.

DRUMMONDII (Waller-Franklin).—Like the last and variable in colour.

PICTA JOSEPHUS (Benary), **H.C.**—24 inches; flowers 2 to $2\frac{1}{2}$ inches, dull crimson-carmine, broadly—for $\frac{1}{2}$ length of petal—striped light cadmium-yellow; disc $\frac{3}{4}$ inch, reddish-brown. A good even stock.

PICTA JOSEPHUS (Dobbie, Waller-Franklin).—Like the last, but less regular.

PICTA (Benary, Carter).—Like the last, but flowers bright pompeian-red, tipped—for $\frac{1}{2}$ length of petals—light cadmium-yellow.

Crimson-carmine tipped orange-scarlet.

AMBLYODON (Dobbie, Watkins & Simpson).—28 inches; flowers 2 inches, bright crimson-carmine tipped orange-scarlet; disc $\frac{3}{4}$ inch, dark reddish-brown.

Dull crimson-carmine, tips paler.

AWARDS.

Indian Chief, A.M. September 16, 1929. Sent by Messrs. Waller-Franklin Seed Co. of Los Angeles, California, U.S.A.

Bronze-Red, A.M. September 16, 1929. Sent by Messrs. Sutton & Sons.

INDIAN CHIEF (Waller-Franklin), A.M.—24 inches; flowers 2 to 2½ inches, cup-shaped, dull crimson-carmine, tips paler; disc ¾ inch, bright reddish-brown.

INDIAN CHIEF (Benary).—A less regular stock of the last.

PICTA SALMONEA (Dobbie).—Much like 'Indian Chief,' but flowers somewhat paler. Stock not true.

SALMON (Watkins & Simpson).—An irregular stock of the last.

BRONZE-RED (Sutton), A.M.—Resembles 'Indian Chief,' but flowers rather paler and flatter.

Colours mixed.

AWARDS.

Picta Single Mixed, A.M. September 16, 1929. Sent by Messrs. W. H. Simpson of Monument Road, Birmingham.

Annual Mixed, H.C. September 16, 1929. Sent by Messrs. Barr.

PICTA SINGLE MIXED (W. H. Simpson), A.M.—20 inches; flowers 2 to 2½ inches, mostly yellow, cream, and shades of yellow and carmine bicolors.

ANNUAL MIXED (Barr), H.C.—Like the last, but not quite so regular a stock.

SEMI-DOUBLE.

Dull crimson-carmine tipped yellow.

AURORA BOREALIS (Carter).—18 inches; flowers 2 to 2½ inches, dull crimson-carmine tipped cadmium-yellow; florets tubular; disc ¾ inch, reddish-brown. Stock variable in shade.

DOUBLE.

Cream.

PICTA LORENZIANA, THE BRIDE (Dobbie).—28 inches; flowers 2½ inches diameter, dull cream; florets tubular.

Flowers of mixed colours.

AWARDS.

Lorenziana, A.M. September 16, 1929. Sent by Messrs. Watkins & Simpson of Drury Lane, Covent Garden, W.C. Also sent by Messrs. W. H. Simpson as **Lorenziana Double Mixed** and by Messrs. J. Carter of Raynes Park, S.W., as **Choice Double Mixed**; these share the award.

Picta Fistulosa fl. pl., syn. Lorenziana, H.C. September 16, 1929. Sent by Messrs. F. C. Heinemann of Erfurt, Germany.

LORENZIANA (Watkins & Simpson)	} A.M.—22 to 24 inches; flowers 2½ to 3 inches, mostly cream, or yellow selfs, red and yellow, carmine and red bicolors; florets tubular.
LORENZIANA DOUBLE MIXED (W. H. Simpson)	
CHOICE DOUBLE MIXED (Carter)	

PICTA FISTULOSA FLORE PLENO, SYN. LORENZIANA (Heinemann), H.C.—A less regular stock of the last.

PICTA LORENZIANA BICOLOR (Morris).—Like 'Lorenziana.'

PICTA LORENZIANA (Morris, Daehnfeldt & Jensen, Dobbie, Benary).—Like 'Lorenziana.'

CANTERBURY BELLS TRIED AT WISLEY, 1928-29.

SIXTY-FOUR stocks of seed of Canterbury Bells were sent in for trial in 1928 and all were sown in drills outdoors on May 17, 1928, pricked out into nursery beds on August 9, and planted in their final positions on November 9, 1928. Thirty plants of each stock (where available) were planted 18 inches apart each way. Six stocks failed to germinate or germinated poorly, and they are not further referred to below.

Practically all the plants survived the very trying winter of 1928-29 without injury and flowering commenced on June 20, very little difference being seen in the time of flowering of the several varieties and stocks. The trial made a very bright display when in bloom and exhibited the variations which *Campanula Medium* has given rise to in a convincing fashion. The varieties are grouped below according to their colours and according to the form of the flower, whether (1) normal (single), (2) cup and saucer with the calyx as well as the corolla coloured and the calyx enlarged, or (3) hose-in-hose, with the corolla repeated again and again, making semi-double or fully double flowers.

Other variations noted are differences in height and size of flower, especially width, e.g. among the single white forms one stock had flowers 2 inches wide, another less than 1½ inch though of the same depth. In the cup and saucer varieties the saucer was sometimes entire, sometimes lobed, and it was rare to find a stock giving all plants of this form. Colour rogues were also frequent.

The Floral Committee made recommendations for awards on July 3 and they are set out below.

AWARDS, DESCRIPTIONS, AND NOTES.

Flowers white.

AWARDS.

Single White, A.M. July 3, 1929. Sent by Messrs. Dobbie of Edinburgh.

Calycanthema White, A.M. July 3, 1929. Sent by Messrs. Webb of Stourbridge.

Single.

SINGLE WHITE (Dobbie), A.M.—24 to 28 inches; habit compact; flowers 2 inches diameter; 1½ inch deep. A good even stock.

***SINGLE WHITE (W. H. Simpson).**—22 to 24 inches; habit compact; flowers 1½ inch diameter, 1½ inch deep. Contained pink, blue, and cup and saucer rogues.

SINGLE WHITE (Barr).—A mixed stock.

SINGLE WHITE (Webb).—30 inches; flowers 1½ inch diameter, 1½ inch deep. Contained violet and white speckled with violet rogues.

Cup and Saucer.

CALYCANTHEMA WHITE (W. H. Simpson).—22 inches; habit compact; flowers 1½ inch diameter; 1½ to 1¾ inch deep, saucer 1½ to 2 inches diameter, many lobed. Contained 30 per cent. colour rogues.

CALYCANTHEMA WHITE (Dobbie).—Germination bad.

CALYCANTHEMA WHITE (Daniels).—24 to 26 inches; flowers 1 inch diameter, $1\frac{1}{2}$ inch deep, saucer $2\frac{1}{2}$ to $3\frac{1}{2}$ inches diameter, some lobed. Contained 20 per cent. single-flowered rogues.

CALYCANTHEMA WHITE (Webb), A.M.—26 inches; habit compact; flowers $1\frac{1}{2}$ inch diameter, $1\frac{1}{2}$ inch deep, saucer $2\frac{1}{2}$ inches diameter, entire.

CALYCANTHEMA WHITE (Barr).—28 inches; flowers $1\frac{1}{2}$ inch diameter, $1\frac{1}{2}$ inch deep, saucer $2\frac{1}{2}$ inches diameter, lobed. Contained 25 per cent. colour rogues and 50 per cent. single rogues.

Hose-in-Hose.

DOUBLE WHITE (Webb, Watkins & Simpson).—24 inches; habit compact; flowers $1\frac{1}{2}$ inch diameter, $1\frac{1}{2}$ inch deep. The first contained 20 per cent. and the second 25 per cent. single rogues.

FLORE PLENO ALBA (Haage & Schmidt).—26 to 32 inches; habit compact; flowers $1\frac{1}{2}$ inch diameter, $1\frac{1}{2}$ inch deep. Contained 50 per cent. single and 10 per cent. colour rogues.

Flowers white speckled violet-blue.

Single.

STRIATA (Haage & Schmidt).—32 inches; flowers $1\frac{1}{2}$ inch diameter, $1\frac{1}{2}$ inch deep. Contained 45 per cent. colour rogues.

Flowers rose-pink to rose.

AWARDS.

flore pleno Rose Carmine, A.M. July 3, 1929. Raised and sent by Messrs. Haage & Schmidt of Erfurt, Germany.

Single Rose, H.C. July 3, 1929. Sent by Messrs. E. Webb.

Calycanthema Rose, H.C. July 3, 1929. Sent by Messrs. W. H. Simpson of Monument Road, Birmingham, and Messrs. E. Webb.

Single.

SINGLE ROSE TO BLUSH (Barr).—22 to 26 inch; flowers $1\frac{1}{4}$ inch diameter, $1\frac{1}{4}$ inch deep; pale rose-pink to rose-pink. Contained 45 per cent. cup and saucer rogues.

SINGLE ROSY-CARMINE (Daniels).—30 inches; flowers $1\frac{1}{4}$ to $1\frac{1}{2}$ inch diameter, $1\frac{1}{2}$ to $1\frac{1}{4}$ inch deep; rose-pink shades. Contained 30 per cent. colour and 10 per cent. cup and saucer rogues.

SINGLE ROSY-CARMINE (Dawkins).—30 inches; flowers $1\frac{1}{4}$ to $1\frac{1}{2}$ inch diameter, $1\frac{1}{4}$ to 2 inches deep; rose and rose-pink shades. Contained 10 per cent. colour rogues.

SINGLE ROSE-CARMINE (Barr).—26 to 28 inches; flowers $1\frac{1}{2}$ to 2 inches diameter, $1\frac{1}{2}$ inch deep; rose and rose-pink shades.

SINGLE ROSE (Webb), H.C.—26 to 28 inches; flowers $1\frac{1}{2}$ inch diameter, 2 inches deep; bright rose; somewhat variable in shade.

SINGLE ROSE (Dobbie).—Like the last but a less regular stock.

Cup and Saucer.

CALYCANTHEMA ROSE TO BLUSH (Barr).—30 inches; flowers $1\frac{1}{2}$ inch diameter, $1\frac{1}{2}$ inch deep, saucer $2\frac{1}{2}$ inches wide; blush to rose-pink. Contained 12 per cent. lobed saucers, 15 per cent. colour and 30 per cent. single rogues.

CALYCANTHEMA ROSY-CARMINE (Barr).—30 inches; flowers $1\frac{1}{4}$ to $1\frac{1}{2}$ inch diameter, $1\frac{1}{2}$ to $1\frac{1}{4}$ inch deep, saucer $2\frac{1}{2}$ to $2\frac{1}{2}$ inches diameter; rose-pink shades. Contained 20 per cent. lobed saucers, 10 per cent. colour and 30 per cent. single rogues.

CALYCANTHEMA ROSE (W. H. Simpson, Webb), H.C.—26 to 28 inches; of compact habit; flowers $1\frac{1}{2}$ inch diameter and deep, saucer $2\frac{1}{2}$ to $2\frac{1}{2}$ inches diameter; rose-pink shades; 15 per cent. single-flowered rogues.

CALYCANTHEMA ROSE (Daniels, Watkins & Simpson, Dobbie).—Like the last, but less regular stocks.

CALYCANTHEMA ROSE (Dawkins).—Flowers somewhat paler than the last, otherwise similar.

Hose-in-Hose.

FLORE PLENO ROSE-CARMINE (Haage & Schmidt), A.M.—32 inches; flowers $1\frac{1}{2}$ inch diameter and deep; rose-pink.

DOUBLE ROSE (Watkins & Simpson).—18 inches; habit very compact; flowers $1\frac{3}{8}$ inch diameter, $1\frac{3}{8}$ inch deep; rose-pink. A true stock.

DOUBLE ROSE (Hurst).—26 inches; flowers $1\frac{3}{8}$ inch diameter, $1\frac{3}{8}$ inch deep; rose and rose-pink shades. Contained 35 per cent. single-flowered rogues.

Flowers rosy-mauve.

Single.

SINGLE DEEP LILAC (Dawkins).—30 to 34 inches; flowers $1\frac{1}{2}$ inch diameter and deep; deep rosy-mauve shades. Contained 17 per cent. colour rogues.

Flowers lavender.

AWARDS.

Single Mauve, A.M. July 3, 1929. Sent by Messrs. Hurst of Houndsditch, E.

CALYCANTHEMA MAUVE, A.M. July 3, 1929. Sent by Messrs. Hurst.

Single Mauve, H.C. July 3, 1929. Sent by Messrs. Daniels of Norwich.

Single.

SINGLE MAUVE (Hurst), A.M.—26 to 28 inches; of compact habit; flowers $1\frac{3}{8}$ to $1\frac{1}{2}$ inch diameter, $1\frac{3}{8}$ inch deep; lavender. A true even stock.

SINGLE MAUVE (Daniels), H.C.—22 to 24 inches; of compact habit; flowers $1\frac{1}{2}$ inch diameter and deep; lavender.

SINGLE MAUVE (W. H. Simpson).—Like the last, but very variable in height, and contained 25 per cent. colour rogues.

SINGLE MAUVE (Watkins & Simpson).—Taller than the last, 26 to 28 inches, otherwise similar. Contained 10 per cent. colour rogues.

SINGLE LAVENDER (Barr).—16 to 18 inches; habit very compact; flowers $1\frac{1}{2}$ inch diameter and deep; lavender shades. Contained 15 per cent. colour rogues.

FLORE PLENO CAESIA (Haage & Schmidt).—30 inches; flowers $1\frac{1}{2}$ inch diameter, $1\frac{3}{8}$ inch deep; lavender. Contained 7 per cent. colour rogues.

Cup and Saucer.

CALYCANTHEMA MAUVE (Hurst), A.M.—24 to 26 inches; flowers $1\frac{1}{2}$ inch diameter and deep, saucer $2\frac{1}{2}$ to $2\frac{3}{4}$ inches diameter; lavender shades. Contained 10 per cent. single-flowered plants.

CALYCANTHEMA MAUVE (Watkins & Simpson).—Like the last, but a less regular stock.

CALYCANTHEMA LAVENDER (Barr).—30 inches; flowers $1\frac{1}{2}$ inch diameter and deep, saucer $2\frac{1}{2}$ inches diameter, 50 per cent. lobed; lavender shades. Contained 30 per cent. rogues.

CALYCANTHEMA LAVENDER (W. H. Simpson).—26 to 28 inches; flowers $1\frac{3}{8}$ inch diameter, $1\frac{1}{2}$ inch deep, saucer $2\frac{1}{2}$ inches diameter, 25 per cent. lobed; deep lavender shades. Contained 50 per cent. rogues.

Hose-in-Hose.

DOUBLE MAUVE (Watkins & Simpson).—24 inches; of compact habit flowers $1\frac{3}{8}$ inch diameter and deep; lavender-mauve. Contained 20 per cent. single-flowered plants.

Flowers violet-blue.

AWARD.

flore pleno coerulea, H.C. July 3, 1929. Raised and sent by Messrs. Haage & Schmidt.

Single.

SINGLE BLUE (Dobbie).—24 inches; of compact habit; flowers $1\frac{1}{2}$ inch diameter, $1\frac{3}{8}$ inch deep; violet-blue shades. Germination poor.

SINGLE PURPLE-BLUE (Barr).—30 inches; flowers $1\frac{3}{8}$ to $1\frac{1}{2}$ inch diameter, $1\frac{3}{8}$ to $1\frac{1}{2}$ inch deep; violet-blue shades. Contained 25 per cent. rogues.

SINGLE BLUE (Webb).—30 inches; flowers $1\frac{1}{2}$ inch diameter, $1\frac{3}{8}$ to 2 inches deep; rich violet-blue shades. Contained 8 per cent. colour rogues.

Cup and Saucer.

CALYCANTHEMA BLUE (Daniels).—24 to 30 inches; flowers $1\frac{1}{2}$ inch diameter, $1\frac{1}{2}$ to $1\frac{3}{4}$ inch deep; saucers $2\frac{1}{2}$ to $2\frac{3}{4}$ inches diameter, 50 per cent. lobed; violet-blue shades. Contained 10 per cent. colour rogues and 30 per cent. single-flowered plants.

CALYCANTHEMA BLUE (Watkins & Simpson).—18 to 28 inches; flowers $1\frac{1}{2}$ inch diameter and deep; saucers $2\frac{1}{2}$ to $2\frac{3}{4}$ inches diameter, 50 per cent. lobed. Contained 20 per cent. single-flowered rogues.

CALYCANTHEMA PURPLE-BLUE (Barr).—30 inches; flowers $1\frac{1}{2}$ inch diameter, $1\frac{1}{2}$ to $1\frac{3}{4}$ inch deep; saucers $2\frac{1}{2}$ to 3 inches diameter, 15 per cent. lobed; violet-blue shades. Contained 20 per cent. colour rogues and 28 per cent. single-flowered plants.

CALYCANTHEMA DARK BLUE (Haage & Schmidt).—Like the last. Contained 9 per cent. colour rogues and 45 per cent. single-flowered plants.

Hose-in-Hose.

VIOLET KING (Dawkins, Watkins & Simpson).—12 to 15 inches; habit very compact; flowers $1\frac{1}{4}$ to $1\frac{3}{8}$ inch diameter, $1\frac{1}{2}$ to $1\frac{3}{8}$ inch deep; violet-blue shades. The first contained 30 per cent. single-flowered plants, the second 45 per cent.

DOUBLE BLUE (Watkins & Simpson).—20 to 22 inches; flowers $1\frac{1}{2}$ inch diameter, $1\frac{3}{8}$ to $1\frac{1}{2}$ inch deep; violet-blue shade. Contained 4 per cent. colour rogues, 20 per cent. single-flowered plants.

DOUBLE BLUE (Webb).—Like the last, but taller, 26 to 28 inches, and somewhat larger flowers. Contained 4 per cent. colour rogues.

FLORE PLENO COERULEA (Haage & Schmidt), H.C.—32 inches; flowers $1\frac{3}{8}$ inch diameter, $1\frac{1}{2}$ to $1\frac{3}{8}$ inch deep; deep violet-blue.

Mixed colours.*Single.*

NEW PYRAMIDAL MIXED (Daniels).—Flowers mostly white, pink, lavender, and violet. True to type.

Cup and Saucer.

CALYCANTHEMA DOUBLE MIXED (Watkins & Simpson).—Flowers mostly white, pink, lilac, lavender, and violet. Contained 18 per cent. single-flowered plants.

Hose-in-Hose.

CALYCANTHEMA DOUBLE (Barr).—Contained 10 per cent. single-flowered and 60 per cent. cup-and-saucer-flowered plants.

DOUBLE (Barr).—Flowers mostly white, lavender, pink, and violet. Contained 45 per cent. single-flowered plants.

BRUSSELS SPROUTS TRIED AT WISLEY, 1928.

EIGHTY-SIX stocks of Brussels Sprouts were received for trial at Wisley in 1928, and all were sown on March 8, and transplanted in rows three apart each way on May 29, two rows of each stock being grown.

Three stocks grown are not included below. The remainder are grouped into (1) dwarf varieties up to 15 inches in height; (2) medium varieties between 15 and 24 inches in height; (3) tall varieties over 24 inches in height. Each of these divisions is again divided into those with (1) "small sprouts" up to $1\frac{1}{2}$ inch diameter; (2) "medium sprouts" between $1\frac{1}{2}$ and $1\frac{1}{2}$ inch diameter; and (3) "large sprouts" over $1\frac{1}{2}$ inch diameter.

The season at which the sprouts were first fit for use is indicated in every instance.

The name of the variety is followed by the source from which the seed was obtained, then by the award given (if any), then by descriptive notes.

AWARDS, DESCRIPTIONS, AND NOTES

A. Dwarf Varieties (up to 15 inches).

AWARD.

Early Dwarf, H.C. October 15, 1928. Sent by Messrs. Daehnfeldt & Jensen of Copenhagen, Denmark. Award recommended as an Early Dwarf variety for private gardens. Also sent by Messrs. Daehnfeldt & Jensen as 'Fest und Viel,' a misnomer.

1. *Sprouts small.*

EARLY DWARF (Daehnfeldt & Jensen), **H.C.**—15 inches; foliage of medium size, medium grey-green, basin-shaped; sprouts solid, roundish, tightly placed. Stood well. The stock sent by Messrs. Daehnfeldt & Jensen as 'Fest und Viel' was identical with this, and distinct from 'Fest und Viel' as sent by others. August 31.

DWARF GEM (Sutton, Cullen).—Very variable stocks as regards height and foliage. October 10.

LITTLE GEM (Bair).—A mixed stock.

ODENSE MARKET (Daehnfeldt & Jensen).—12 to 15 inches; foliage of medium size; dark grey-green; sprouts very solid, somewhat flat-sided, tightly placed. Stood well. October 10.

HERCULES (Daehnfeldt & Jensen).—15 inches; foliage of medium size, dark dull green; sprouts solid, oblong, tightly placed. Contained plants with loose sprouts. October 10.

2. *Sprouts large.*

THE WEBB (Webb).—12 to 14 inches; foliage large, medium grey-green; sprouts solid, long to roundish, tightly placed. Contained plants with small sprouts. October 10.

B. Medium Varieties (up to 24 inches).

AWARDS.

Spiral, A.M. November 19, 1928. Raised and sent by Professor Spranger of Wageningen, Holland. Two other stocks of this variety were sent, one by

the same sender and the other by Zaaizaadvereeniging 'Nunhem' of Nunhem, Limburg, Holland; these were **Highly Commended**. Also sent as 'Standard' by Messrs. Barr of King St., Covent Garden, W.C.: this shares the latter award.

Hartlebury Giant, H.C. November 19, 1928. Raised and sent by Mr. Hedley Masters of Hartlebury.

One & All (Fest und Viel), C. October 15, 1928. Raised by Messrs. Heinemann of Erfurt, Germany, and sent by them and Messrs. Olsen of Odense, Denmark. Award recommended as an early half-dwarf variety for private gardens.

Favourite, C. November 19, 1928. Sent by Messrs. Dobbie of Edinburgh.

1. *Sprouts small.*

SOLIDITY (Alexander & Brown).—20 inches; foliage of medium size, somewhat incurved, pale grey-green; sprouts round, loosely placed. October 10.

NAIN DE LYON (Rivoire).—A mixed stock.

DEMI-NAIN DE LA HALLE (Rivoire).—20 inches; foliage of medium size, medium grey-green; sprouts solid, somewhat flat, tightly placed. Stood well. October 10.

ONE & ALL or FEST UND VIEL (Heinemann, Olsen), **C.**—18 inches; foliage of medium size, dark, incurved; sprouts very solid, flat-sided, tightly placed. Stood well. Suitable for private gardens. September 20.

MACGREGOR'S GATHERING (Stuart & Mein).—18 inches; foliage of medium size, dark grey-green tinged red; stalks tinged red; sprouts solid. Contained non-sprouting plants. October 20.

WESLANDIA (Harrison).—Stock mixed.

WESLAND (Zwaan & van der Molen).—Like the last. A mixed stock.

XXX (Harrison).—18 to 22 inches; foliage pale grey-green; sprouts solid, closely placed. October 10.

SPIRAL No. 2 (Sprenger), **A.M.**—22 inches; foliage of medium size, medium grey-green, incurved, margins tinged red; stalks tinged purplish; sprouts very solid and hard. Closely arranged in a spiral. Stood well. A good even stock. November 2.

SPIRAL No. 4 (Sprenger), **H.C.**—A less even stock of the last. November 2.

SPIRAL VARIETY NUNHEM (Zg. Nunhem), **H.C.**—A less even stock of Spiral No. 2. November 2.

STANDARD (Barr), **H.C.**—Like the last. Distinct from 'Standard' as sent by Messrs. Zwaan & van der Molen. November 2.

SPIRAL No. 3 (Sprenger).—Irregular in height and variable in amount of red on the stalks and foliage. November 2.

SPIRAL (Spruijt).—A poor and variable stock with many plants bearing loose and larger sprouts. November 2.

PRIDE OF THE MARKET (Webb).—16 to 18 inches; foliage of medium size, dark green; sprouts solid, closely placed. Many plants with loose sprouts. November 2.

AMAGER MARKET (Olsen).—18 inches; foliage dark grey-green; sprouts solid, flat-sided, closely placed. Stood well. Foliage variable. November 2.

FILLBASKET (Barr).—A mixed stock. Distinct from 'Fillbasket' as sent by Messrs. Sutton. November 2.

MATCHLESS (Webb).—18 to 24 inches; foliage large, medium grey-green; sprouts somewhat solid, loosely arranged. Many plants with loose open sprouts. Soon burst. November 2.

2. *Sprouts of medium size.*

STANDARD (Zwaan & van der Molen).—20 inches; foliage of medium size, medium grey-green, sprouts solid. An uneven stock with many plants with loose open sprouts. November 2.

MASTERMAN (Finney).—16 to 24 inches; foliage large, medium grey-green; sprouts solid, closely placed. October 12.

SKIRBECK FAVOURITE (Pearson).—18 to 20 inches; foliage of medium size, pale dull grey-green; sprouts somewhat solid, closely placed. Soon burst. November 2.

FAVOURITE (Dobbie), **C.**—22 inches; foliage large, dark green; stalks somewhat tinged with purple; sprouts round, solid, closely placed. Stood well. Late. November 21.

HARTLEBURY GIANT (Hedley Masters), **H.C.**—16 to 17 inches; foliage large, medium green; sprouts very solid, round, closely placed. Stood well. Early. A good even stock. Crop good. October 10.

SCRYMGER'S GIANT (Sutton).—A mixed stock. October 10.

PERFECTION (Carter).—20 inches; foliage large, dark green; sprouts solid, oval, closely placed. Crop poor. Contained plants with no sprouts and others with very loose sprouts. November 2.

GOLIATH (Carter).—A mixed stock. November 2.

3. *Sprouts large.*

ENGLISH MARKET GARDENER (Zwaan & van der Molen).—18 inches; foliage of medium size, light green; sprouts solid, very variable in size. October 10.

MASTER GIANT (Clibrans).—A mixed stock. October 10.

FAVOURITE (Clucas).—16 to 24 inches; foliage large, dark green; sprouts solid, oblong, closely placed. Foliage very variable. November 2.

FILLBASKET (Sutton).—20 inches; foliage large, medium green; sprouts very solid, closely placed, flat round. Stood well. Contained plants with loose open sprouts. Distinct from variety sent under this name by Messrs. Barr. November 2.

COVENT GARDEN (W. H. Simpson, Morris).—22 inches; foliage large, medium green, crinkled; sprouts solid, oblong. The second stock was very irregular. October 10.

COVENT GARDEN SELECTED (Hurst).—Like the last. October 10.

ORMSKIRK GIANT (Clucas).—16 to 18 inches; foliage large, medium green; sprouts very solid, flat round, closely placed. Stood well. October 10.

EARLY GIANT (Clucas).—18 to 22 inches; foliage large, medium green; sprouts solid, oval, closely placed. Stood well. October 20.

COLOSSAL (Daniels).—A very mixed stock. October 10.

C. Tall varieties (over 24 inches).

AWARDS.

Evesham Special, A.M. November 19, 1928. Raised and sent by Messrs. Bunting of Bucknall St., W.C., and Messrs. Speed of Evesham.

Supreme, H.C. November 19, 1928. Raised and sent by Messrs. Middlehursts of Moorfields, Liverpool.

Forex, H.C. November 19, 1928. Sent by Messrs. Harrison of Leicester and Messrs. Barr of King Street, Covent Garden, W.C.

Darlington, H.C. November 19, 1928. Raised by Messrs. Kent & Brydon and sent by Mr. J. W. Scarlett of Musselburgh.

Offenham, C. November 19, 1928. Sent by Messrs. Speed.

Bedfordshire Strain, C. November 19, 1928. Sent by Messrs. Watkins & Simpson, Drury Lane, Covent Garden, W.C.

Masterpiece, C. November 19, 1928. Raised and sent by Messrs. J. P. Harvey of Kidderminster.

Late Hartlebury, C. November 19, 1928. Raised and sent by Mr. Hedley Masters.

1. *Sprouts small.*

ROSNY (Barr).—24 to 28 inches; foliage of medium size, dark dull bluish-green, incurved sprouts very solid, closely placed. An irregular stock. November 2.

RED STALK (Zwaan & van der Molen).—24 to 26 inches; foliage of medium size, dark dull green tinged bluish, incurved; stalks tinged red; sprouts very solid, tightly placed. November 2.

PERFECTION (E. W. King).—20 to 28 inches; foliage large, medium grey-green; sprouts very solid, round, closely placed. October 20.

EXHIBITION (Dickson & Robinson).—24 to 28 inches; foliage large, dark dull green; sprouts very solid, closely placed. Stood well. November 2. Two stocks of this variety were sent. No. 1 was a poor stock with plants which bore loose open sprouts; No. 2 a more regular stock than No. 1, but requires further selection.

EMPEROR (Barr).—24 inches; foliage large, dark dull grey-green; sprouts solid, round. Very variable in foliage and amount of red tinging on the leaf-stalks. November 2.

REARGUARD (Carter).—28 inches; foliage of medium size, dark dull grey-green, roundish; sprouts very solid, oval. Contained plants which did not bear sprouts. November 21.

2. *Sprouts of medium size.*

EXHIBITION (Sutton).—24 to 28 inches; foliage large, medium dull grey-green, savoy-like; sprouts somewhat loose. Soon burst. November 9.

KING OF THE MARKET (Nutting).—A variable stock. November 2.

DALKEITH (J. W. Scarlett).—26 to 28 inches; foliage large, medium grey-green, margins tinged purple; sprouts somewhat loose. Soon burst. November 2.

THE WROXTON (R. Veitch).—24 to 28 inches; foliage large, dark grey-green; sprouts somewhat loose, loosely placed. Soon burst. An irregular stock. November 2.

EXHIBITION (Dobbie).—A very irregular stock; many plants with nosprouts. November 2.

EXHIBITION (R. Veitch).—A mixed stock. November 2.

DARLINGTON (J. W. Scarlett), C.—26 inches; foliage large, dark dull green; sprouts very solid, closely placed. Stood well. November 12.

DARLINGTON (Morris, W. H. Simpson, Kent & Brydon, Nutting).—Less regular stocks of the last. November 2.

SUPREME (Middlehursts), H.C.—24 to 26 inches; foliage large, dark dull grey-green; stalks somewhat tinged with red; sprouts very solid, closely placed, round. Stood well. November 2.

3. *Sprouts large.*

FOREX (Harrison, Barr), H.C.—24 to 26 inches; foliage large, light grey-green; sprouts very solid, closely placed. Stood well. October 20.

GIANT (Middlehursts).—A mixed stock. October 20.

PROLIFIC EXHIBITION (Kelway).—A very mixed stock.

PRIZEWINNER (Hill).—24 to 28 inches; foliage large, medium green; sprouts solid, oval, closely placed. Soon burst. October 10.

OFFENHAM (Speed), C.—24 to 26 inches; foliage large, light grey-green; sprouts somewhat loose. Soon burst. Crop good. October 10.

BEDFORDSHIRE GIANT (Dickson & Robinson).—24 to 26 inches; foliage large, medium grey-green; sprouts solid, round. Stood well. October 20.

BEDFORDSHIRE STRAIN (Watkins & Simpson), C.—26 inches; foliage large, medium green; sprouts very solid, closely placed, round. Stood well. October 20.

BEDFORDSHIRE PRIZE (Bunting, Cullen, Speed).—Like the last. The first and third stocks were variable with plants with loose, open sprouts, the second was somewhat irregular. October 20.

EVESHAM SPECIAL (Bunting, Speed), A.M.—26 to 28 inches; foliage large, medium grey-green; sprouts solid, round, closely placed. Crop good. Soon burst. October 20.

EVESHAM (Cullen).—A mixed stock of the last.

EVESHAM GIANT (Cooper, Taber).—Of 'Evesham Special' type, but a less regular stock. October 20.

EVESHAM SPECIAL (Watkins & Simpson).—Of 'Evesham Special' type. 'A' selection was on the whole a smaller sprout than 'B' selection, while the latter selection was the better stock, being more regular than the first selection. October 20.

MASTERPIECE (Harvey), C.—26 inches; foliage large, medium grey-green, savoy-like, margins of leaves purplish; sprouts solid, flat round, closely placed. Stood well. November 10.

LATE HARTLEBURY (Hedley Masters), C.—24 to 28 inches; foliage large, medium, grey-green; sprouts solid, roundish. A good even stock. November 10.

EXHIBITION (Carter).—24 to 28 inches; foliage large, dark green; sprouts solid, long oval; stood well. Contained plants with small sprouts. November 10.

BOOK REVIEWS.

"The Book of the Tulip." By Sir Daniel Hall, K.C.B., F.R.S. (Martin Hopkinson, London, 1929.) 2rs. net.

This book forms one more in that valuable series of handbooks published by Messrs. Martin Hopkinson of which Dykes's "Handbook of Garden Irises" was the first.

The present volume has broken away from the others by the addition of coloured plates, and a consequently enhanced price.

It is the book that all interested in any way in Tulips have so long desired. Being the fruit of over thirty years of study and of personal cultivation of every type of Tulip obtainable, its pronouncements may be accepted as of such high authority that nothing short of further discoveries in the wild homes of species, or fresh experiments with living forms, can embolden any one to question their accuracy. The author's style is crisp and restrained, leaving the pleasing impression of a very clear mind marshalling carefully verified facts in the polished English of a bygone century.

Seldom, if ever, has a genus of plants found a monographer who combined the virtues of scientist, practical cultivator, and trained florist as is the case in this book. We owe many good garden varieties to the author's skill as a raiser as well as the excellent Chapter X. dealing with their production. The florist in his nature is responsible for Chapter VIII. on the English Florists' Tulip. It is to be hoped that this wonderful account of the history and perfections of perhaps the most refined and beautiful forms and colours to be found in any flower will induce fresh enthusiasts to carry on the traditions and work of former raisers. The concise and masterly grouping and descriptions of species of Tulips in Chapter IV. form a fine piece of scientific botanical work made easy for all who read it by the use of plain English and a minimum of botanical terms. As a physiologist Sir Daniel gives us, in the chapter on Taxonomy, a valuable epitome of the discoveries lately made by cytologists as to the effects of the rearrangements and numbers of chromosomes in the fertilization of ovules on the resulting offspring.

It is the best short elucidation of this interesting addition to knowledge to be found anywhere. It seems a pity, though, that a glossary of the few necessary botanical and scientific terms, especially those of recent adoption, has not been included in the book. Many of these terms are explained where they first occur in the text, *e.g.* clone, haploid, diploid, etc., but a list in alphabetical order and fully explained would be a help to many unfamiliar with the use of such terms. The coloured plates are the least satisfactory part of the work. Most of them are necessarily so much reduced in size as to

give little idea of the natural beauty and form of the original plant. The best are those showing *T. Fosteriana* and the English and Darwin Tulips. It is a book that none who wish to grow and know Tulips can afford to be without, and it will long remain the standard work on the genus.

"Daffodil Growing for Pleasure and Profit." By Albert F. Calvert. 8vo. 412 pp. (Dulau, London, 1929.) 21s.

The author-editor of this work has done signal service to all who are interested in Daffodils, from either the artistic or commercial point of view, in gathering under one cover such a vast amount of valuable information.

It is only necessary to glance at the chapter headings to be convinced of the many-sidedness of its contents. Thus in the eighteen chapters by the author we have such diversity as History; Classification; the Daffodil in catalogues, a very interesting chapter dealing with the lists of Baylor Hartland and Peter Barr; the question of lifting bulbs—an instructive collection of varying views.

No fewer than ten of these chapters deal with the commercial side of Daffodil growing so practically and authoritatively that they will be found of great value. For, as the author states in his preface, "I venture to regard the chapters which treat of marketing the harvest as of not less importance than those which deal with raising the crop." Then there are sixteen chapters contributed by the greatest experts of the Daffodil world.

The Rev. George Engleheart deals with the wild species of *Narcissus*; Mr. P. D. Williams with the progress of the Daffodil from 1890-1910. Raising from seed by The Brodie contains the very essence of that difficult undertaking. Diseases and pests should disappear from among us after the chapter and its excellent illustrations contributed by such able experts as Messrs. Hodson and Beaumont.

At the end of the book are 199 of the best photographic portraits of all divisions of Daffodils to be found anywhere, besides fifteen plates showing growths of cut and growing blooms, and five portraits, making a total of 236 illustrations.

The type and general appearance of the book are both good, the proof-reading not equally so. The mysterious words "Groupla" on p. 15, "Oppollo," and the inclusion of the date 1884 in the eighteenth century doubtless arise from this cause. The book is worthy of a place among those that should be close at hand for reference, if its stout figure will permit of its insertion in the shelf for indispensables.

"Modern Fruit Growing." By W. P. Seabrook. Pp. 278. Illustrated. (Ernest Benn, Ltd., London, 1929.) 6s. net.

Commercial fruit-growing methods have undergone remarkable development since the first edition of this excellent book was published in 1913 (reviewed in this JOURNAL, 43, p. 539). Particularly in the direction of grading, packing, and marketing fruit, and spraying to combat pests and disease, have methods improved. These revised practices the author explains in considerable detail in the pages of this, the third edition, which has been entirely re-written.

A volume of helpful, essentially practical advice is offered upon almost every conceivable phase of commercial fruit-growing, based upon a personal experience in every branch of the industry. The numerous illustrations are helpful, and as a guide or reference work for grower and student alike, this book can be wholeheartedly recommended. But one error is noted: on p. 75, Monarch plum is said to be self-sterile; actually Monarch is self-fertile, setting fruit freely when pollinated with its own pollen.

"Spanish Gardens." By Mrs. C. M. Villiers-Stuart. 8vo. 139 pp. (Batsford, London, 1929.) 25s. net.

No one could fail to be delighted with a mere glance at the fascinating illustrations in Mrs. Villiers-Stuart's book "Spanish Gardens," but few will be satisfied with the illustrations only, good as they are, but will prefer to read about the old Moorish gardens which are so well described by the authoress. The royal gardens of the Alcazar at Seville, the Generalife at Granada, the Palaces of Aranjuez and La Granja are fairly well known to English travellers, though comparatively few visit the last two, while the many smaller and often more beautiful private ones are quite unknown to tourists. The neighbourhood of Madrid is by no means favourable for gardens, as Madrid itself is nearly 2,500 ft.

above the sea and is swept by icy winds from the Guadarramas in winter and scorched by a burning sun in summer which quickly dries up all vegetation. The climate of Madrid has been described as "nueve meses de invierno y tres de infierno" (nine months of winter and three of hell). Another saying is that "El aire de Madrid es tan sutil que mata á un hombre sin apagar un candil" (The air of Madrid is so treacherous that it will kill a man without extinguishing a candle).

It is therefore scarcely surprising that there should be so few good gardens near Madrid. The vast and gloomy Escorial, more monastery than palace, only has a few beds of clipped box on the terraces, but nothing to call a garden. The other two royal gardens in this neighbourhood—Aranjuez and La Granja—are more French than anything else, and might have been laid out by Le Nôtre himself, although Moorish influence may still be observed.

The reader will be more interested, however, in the old Moorish gardens of Andalucia, which are so different from anything we have in England. Comparatively few remain of the enormous number which existed in the days of the Moors, but this is owing to the neglect of the old system of irrigation which they introduced and which broke down on their expulsion. Still, Spain is actually the only country in the world where gardens of the thirteenth century exist as they were originally planned.

The courtyard of the Mosque at Cordova is the oldest garden in Europe, having been laid out by Al Mansur in 976. Mohammedan art in Spain drew its inspiration largely from Persia, so that the beautiful azulejos (Moorish tiles), the canals, fountains and water-runners all have their origin in Persia.

The Alhambra is more celebrated perhaps for its architecture than for its gardens, but the Generalife, the lofty garden on the hill above the Alhambra, has captivated all who have visited it. The illustrations show well the beauty and charm of these gardens with their canals and fountains, the invariable feature of Moslem gardens. One cannot help sympathizing with the unfortunate Moors on their expulsion from this beautiful country by Ferdinand and Isabella, and the old Moorish lament heard at evening when work ceases: "Granada, my beloved; Oh, Granada, I shall never see thee again," is inexpressibly haunting and sad.

A large number of old farmhouses in the island of Majorca are described, and very beautiful they must be with their tiled kitchens, their courtyards (patios), and small formal gardens filled with Orange, Lemon, Pomegranate, Cypress, Olive, and Bay. It would be difficult perhaps to find a more beautiful garden than Raxa in this island. Although italianized by Cardinal Despuig at the latter end of the eighteenth century, it still retains some of its old Moorish features with its centuries-old Olive trees, probably planted by the last Moorish owner, the Bays and Cypresses, Almond trees and Aleppo pines, the beds filled with Scarlet Geranium, white Lilies, Amaryllis and grey *Cineraria maritima*, while the channels of rushing water everywhere make the whole a most entrancing picture.

Many beautiful gardens are described in Majorca, as are also several in Catalonia, "El Laberinto" near Barcelona being the most celebrated.

Altogether Mrs. Villiers-Stuart has written a most delightful and scholarly book which all students of garden architecture and garden-lovers should read.

"Fruit Culture." By H. C. Davidson. 8vo. 142 pp. (The Bodley Head, London, 1929.) 3s. 6d. net.

This little book belongs to the Handbook of Practical Gardening Series. Had it been published a few years ago it must have commanded more favourable notice than is now possible. In passing, the reader should note that, contrary to statements in the book, wind plays little or no useful part in the pollination of hardy fruits, excepting nuts (p. 14); that there is no need for the planter to adopt the involved method of arranging varieties in the garden to facilitate cross-pollination (p. 21); that American Gooseberry Mildew is not a "notifiable disease" (p. 107); that figs. 32 and 33 do not picture, respectively, the "whip" and the "tongue" grafts, as labelled; and that fig. 5 is incomplete, the explanatory lettering being absent.

"Orchard and Small Fruit Culture." By E. C. Auchter and H. B. Knapp. 584 pp. 278 Figs. and Plates. (Chapman & Hall, London, 1929.) 25s. net.

This volume—a textbook—is prepared primarily for the student, yet in the detailed accounts of orchard management, the preparation of fruit for market, marketing methods, etc., the practical grower will find much helpful guidance.

Part I is devoted to Orchard Fruits, 473 pp.; Part II to Small Fruits, 80 pp.

The authors strike an original note by confining Chapter I to Harvesting, Storing and Marketing methods; not until Chapter III is reached is the establishment of the orchard, planting trees, etc., dealt with—which is unusual for this type of book.

The chapter on the Growth of the Tree and the Forming of Fruit Buds deals with matters of first importance to growers, since in order that the trees may properly be pruned, sprayed and fertilized, some knowledge of when and where fruit buds are formed, and the factors influencing their formation, is very necessary.

In the section devoted to the growing of Bush Fruits it is interesting to note there are restrictions regarding the growing of currants in the United States. "Due to their relationship to the white pine blister rust of five-needle pines the culture of these fruits should not be attempted in areas where these trees are important, excepting with . . . the observance of governmental restrictions."

"The cultivated black currant is considered a special menace." Later on it is stated "the black currant, so popular in England, has but few devotees here, due perhaps to its strong and peculiar flavour."

The numerous figures and plates are mostly clear and helpful, and the many references to bulletins and scientific papers at the end of each chapter add considerably to the educational value of the book, to student and grower alike.

"Nature round House and Garden." By W. P. Westell. 8vo. 125 pp. (Sheldon Press, London, 1928.) 2s. 6d. net.

It is of course true that "friends, as well as foes, are indiscriminately destroyed in the garden," and pity 'tis, 'tis true. Ignorance accounts for some of it, and this little book may help to dispel it, if diligently read. Spraying accounts for a good deal too, and it is often a nice question whether we shall use a spray, efficient against a pest, or not, because in destroying the pest it may destroy the enemy of the pest too.

There is something about the garden in this book, and although sometimes perhaps a little "at sea" with names, the author is obviously in love with his garden. Then follow chapters on the animals, the mice, bats, birds, and insects that may be found in or near it.

It is worth while to cultivate the spirit of the old naturalists, and to take an interest in the things that live so near us, though often unseen; that feed almost unknown (and often unwanted by us) upon our bounty. This little book will help us.

Perhaps the obvious is emphasized unduly. A pen-and-ink sketch labelled "A Rose," for instance, is scarcely needed in these days, even by the very ignorant; and while there may be a few who think—if they think—that Daffodils are derived from trees, not many such will be likely to consult this book and learn what a Daffodil actually looks like when seen in an outline drawing.

"Host Index of the Fungi of North America." By A. B. Seymour. La. 8vo. xiii + 732 pp. (University Press, Harvard, 1929.) 37s. 6d.

This is a list of plants occurring in N. America with the fungi which have been recorded upon them and a partial synonymy of the fungi. A work, this, which must have cost its author much dipping into books and which should prove valuable as an indication of what parasites have heretofore been recorded on various plants.

"Textbook of Tropical Agriculture." By Sir H. A. Nicholls, F.L.S. Ed. 2 revised by J. H. Holland, F.L.S. 8vo. xxxvi + 639 pp. (Macmillan, London, 1929.) 15s. net.

The first edition of this excellent textbook was reprinted several times, and after a lapse of nearly forty years, during which crops brought under cultivation have increased and methods changed, a revision was due, and it has been done by Mr. Holland, Assistant in the Museum at the Royal Botanic Gardens, Kew.

The first part of the book (pp. 1-108) deals with principles, general tillage practice, and such operations as grafting and budding. The second and much larger part takes each type of crop in turn and describes the method of its cultivation and preparation for market. The vast range of vegetable products we draw from the Tropics necessitates a great deal of detail, and as a textbook for schools we can recommend this book. Coffee, cacao, tea, sugar-canes, orange, lime, grape-fruit, banana, coconut, pineapple, various other fruits, spices, tobacco, drugs, dyes, tanning materials, maize, rice, guinea-corn, cassava, arrowroot, yam, peas, fodder plants, rubber, gutta-percha, balata, fibre plants,

oil plants, all come in for detailed treatment. Timber trees naturally are not included, since they come into the domain of Forestry rather than Agriculture.

"Your Flower Garden and the Things that Matter." By A. E. Livingstone. 8vo. xi + 208 pp. (Lockwood, London, 1929.) 5s. net.

This is a useful little book with coloured and black-and-white illustrations of plants and gardens, and generally clear directions for the carrying out of the common operations of gardening. Lists of plants deemed suitable for various situations are given, but here we think the author might have exercised a little more discretion. He recommends, for instance, *Tulipa Greigin* for the rock garden and omits *T. Kauffmanniana* and *T. dasystemon*. He recommends *Colchicum autumnale* and omits *C. speciosum*, though the rare *C. luteum* is included. *Hypericum olympicum* is omitted, but the too large *H. patulum* and *H. Moserianum* are included. *Veronica Andersonii* needs a big rock garden to accommodate it, and yet we think this book is rather aimed at the owner of the small garden. We must take exception to the heading of Chapter XIV. too, for *Arbutus*, *Azara*, *Berberis*, *Buddleia*, *Ceanothus*, *Chimonanthus*, *Escallonia*, *Forsythia*, *Kerria*, *Magnolia*, *Prunus*, *Pyrus*, *Ribes*, however suitable they may be for a place against or on a wall, are in no sense climbing plants.

A little looseness in the application of words is the chief fault in what is really an excellent little book.

"American Plants for American Gardens." By Edith A. Roberts and Elsa Rehmman. 8vo. (Macmillan Co., New York, 1929.) 8s. 6d. net.

It is pleasant to find a book devoted to utilizing the native plants of a country for its gardens, and the preservation of the characteristic native flora as a setting for a home and the more formal portions of its garden. English gardeners have not the chance to set their home in Maple and Hemlock woods or on the Juniper hillside—that is to say, among groves of *Juniperus virginiana*, the beautiful Red Cedar chiefly familiar to us as part of our pencils. However, we may learn much from this pleasantly written and well-illustrated book. It too often happens here that before building is commenced the charm of the natural scenery is destroyed: woodland is cut down, drifts of Bluebells destroyed and slopes levelled. Thus those who make a garden there must wait a quarter of a century for shade trees and matured effects.

So it is good to know that gardeners across the Atlantic are valuing their rich inheritance of beautiful wild plants. One wonders what might have been achieved by now if such plants as *Erythronium*, *Aster*, *Viola*, and *Heuchera* had been cultivated and developed in America as Primroses, Cowslips, Pansies, and Daffodils have been in English gardens.

"The Plant-Life of the Balkan Peninsula." By W. B. Turrill. 8vo. (Clarendon Press, Oxford, 1929.) 30s. net.

This masterly work on the Plant-Geography of an exceedingly interesting region appeals more strongly to the botanist than to the gardener. No one could dip into its rich store of observed facts without admiration for the arduous labour and study needed to collect and arrange them.

Those who grow plants will most certainly gain a fresh interest in them after finding their names in the tables which show their connexion with various centres of distribution.

The Rodope Massif, a range of ancient, igneous, resistant rocks, forms the core of the Peninsula. This pretertiary land mass was subjected to a relatively small degree of glaciation in the Ice Age, and is rich in endemic species and ancient types.

In Eocene and Oligocene times the Balkan Peninsula was joined to Asia and only cut off by the forming of the Ægean Sea. The connexion with Central Europe began with the appearance of the Alps, possibly at first with the Carpathians as a bridge, and was afterwards greatly extended by the drying up of the Sarmatic Sea and Pontic Lake on the north.

Thus it happened that the lowland plains of Central Europe were enriched by a northward extension of Asiatic forms, and many of the high mountain species of the Balkan Peninsula came in from the Alps and Carpathians, especially during the Ice Age.

Very interesting lists are given of the plants occurring in the Balkan and Iberian Peninsulas, but not in the much younger geological formations of Italy and Sicily, an indication of the great age of such species.

Rhododendron ponticum found in Spain and Portugal, and then again in S. Bulgaria, has been recorded as fossil in inter-glacial beds in the Alps.

Helianthemum umbellatum, *Hyacinthus amethystinus*, and *Sibthorpia europaea* are other interesting examples.

Distinct but allied species in Spain and the Balkan Peninsula are found in *Ramondia*, *Merendera*, *Thalictrum*, *Erica*, and *Phlomis*.

Gentiana pyrenaica, found in the Pyrenees and Carpathians, is only known on the Rodope Massif in the Balkan Peninsula. Especially interesting chapters deal with plant communities, the influence of man, and endemic and relict species. There are eleven useful maps and excellent photographic illustrations of plants and typical scenery.

"A Brief Course in Biology." By W. H. Wellhouse and J. O. Hendrickson. 8vo. Pp. 200. (Macmillan, New York, 1928.) 7s. 6d.

This little book is based upon the teaching experience of the authors at Iowa State College. Familiar types have been selected for study in the earlier chapters; the concluding chapters deal in an elementary manner with such general topics as the relationship of biology to everyday social life. Of the diagrams, those illustrating the anatomical structure of animals are better reproductions than the others. Naturally enough the text contains but little information of direct interest to gardeners and horticultural students.

"A Laboratory Manual of General Botany." By G. L. Fisk and R. M. Adams. 8vo. Pp. 103. (Macmillan, New York, 1928.) 4s. 6d. net.

The authors state that this manual is the outgrowth of a series of privately printed laboratory manuals which have been in use during many years in the elementary courses of botany at the University of Wisconsin. It is designed primarily to meet the requirements of that department. The student is first introduced to the seed-producing plants and his attention directed to their structure and function; a brief survey of the flowerless plants forms the second half of this course. As suggestions for the selection and preparation of material are also given, any instructor in botany desiring a "ready-made" course may obtain guidance from this book which is, moreover, reasonably priced.

"A Manual of Mendelism." By J. Wilson. Ed. 2. 8vo. 142 pp. (A. & C. Black, London, 1929.) 4s. 6d. net.

Professor Wilson's Manual contains a particularly clear description of Mendel's experiments; his description is singularly free from the technical terms so frequently employed in the modern literature of genetics. A further characteristic retained in the second edition is that the author does not offer his support to the "presence or absence" theory of hereditary factors. Since the first edition appeared the number of able supporters of this theory has undoubtedly decreased.

In the large majority of textbooks dealing with similar topics much space is devoted to a consideration of the physical basis of the hereditary units, believed by many to be located in the chromosomes. In the present volume the author is more concerned with the practical applications of Mendelism than with either the cytological or more theoretical aspects of his subject. The latter half of the book therefore deals with crop-breeding and the breeding of farm stock; here the general argument is well illustrated by frequent references to data collected by the author during his many years of study. This book is one that the keen farmer and particularly the progressive stock-master cannot afford to neglect.

"North American Orchards." By W. H. Chandler. 8vo. 515 pp. (Lea & Febiger, Philadelphia, 1928.) \$4.50 net.

This book is a general account of commercial orchards, in which the author deals with his facts from both the practical and scientific viewpoint, fully realizing, however, that instances exist where successful practice awaits scientific explanation and that the application of further knowledge to the problems of the grower would undoubtedly benefit the industry.

The climatic factors which influence the growth of fruit trees vary within very wide limits in such a large continent as America, but all the available information is of value to the potential planter in a new locality, and especially so in a country in which the industry is relatively young and where accumulated experience of many years cannot be drawn upon. The influence of such factors forms the subject of the early chapters, and is of interest to our own growers despite the different marketing and climatic conditions. We learn the approximate cost of combating adverse climatic conditions, too; for example, to heat a 10-acre orange orchard involves an initial outlay of some 200 dollars an acre and an annual expenditure of some 45 dollars.

The various pome fruits, stone fruits, subtropical and tropical fruits, as well as nut-bearing trees, all come under review. Pruning, thinning, and general orchard practices, including modern methods of marketing, are discussed, and where possible the underlying principles governing these operations are enunciated. The varieties mentioned, as well as the methods of planting, are often widely different from our own. We read of fruits which we cannot produce on a large scale out of doors. The relative merits and demerits of mass production, as contrasted with catering for the discriminating few, need not be discussed here—our growers are fully aware of the problems involved.

This book should form an excellent text for American students of whom the more advanced are encouraged in their studies by the selected references to literature given at the end of each chapter. The illustrations, though varying in size, are clear. The little chapter on "How best the orchard practices are learned" should be read by all students. In its way it is the quintessence of the subject, a refreshing draught of an elixir compounded of knowledge and practice.

"Flower and Vase." By Anne Lamplugh. 8vo. xii + 79 pp. ("Country Life," London, 1929.) 5s. net.

The friendly simplicity of this little book is delightful. Its writer talks to us. She is "I" and she tells "you" what you can or should do plainly but pleasantly.

Thus she writes: "Now you may think Crocuses are not much use for vases, but wait—have you tried them with the tiny *Iris reticulata*? These two combine most beautifully in a squat green vase about three inches high." It is just what we have thought, and now we feel we must try this mixture. The book is divided by the twelve months instead of chapter headings. Each month contains many word-pictures that convince the reader that they had very real originals and are not only talk, even apart from the photographic reproductions of many. That of scarlet geraniums in pewter on a polished table-top "will delight you, I am sure," as the writer puts it.

The plate of nasturtiums with its three trails makes one long for next summer.

The whole book is full of suggestions that are neither costly nor difficult to carry out. Lists are given at the end of each month-chapter divided thus: "For gardeners. Flowers from greenhouse, garden and lane." "For non-gardeners. Flowers from shops."

Practical hints abound for the uses of vases, jugs, candles and "sticks" (an abbreviation that jars a little in such smooth sentences), baskets and bowls, and all who enjoy arranging flowers will be stimulated to try new effects by reading this charming book and looking at its fifty and more illustrations.

"The World's Grasses: Their Differentiation, Distribution, Economics and Ecology." By J. W. Bews. 8vo. 408 pp., 48 figs. (Longmans, Green & Co., London, 1929.) 21s. net.

It is hardly necessary to point out that the economic importance of this family surpasses that of any other; included in the family are several thousand varieties of wheat, the white man's cereal; some hundred varieties of rice, the staple food of the Eastern peoples; and the different species of millet and sorghum, grown by the inhabitants of tropical regions. Many graminaceous plants produce a series of vegetative branches on comparatively short stems; such plants growing together cover the ground and produce a sward, and form the basis of natural and artificial pastures. Perhaps it is not so generally realized that there are about five hundred genera comprehending as many as five thousand species of grasses. One approaches this book, therefore, with a sense of admiration for the undaunted courage and industry of the author who attempts to deal with such a plethoric family in the compass of one volume, and also with curiosity concerning the author's method of dealing with such a vast assemblage as "The World's Grasses."

In the earlier chapters descriptions of the various forms of growth and of the parts of the inflorescence are to be found, after which the range of differentiation within the family is further outlined by examples. The bamboos are among those selected, and very many interesting facts concerning these useful and common garden plants are here found. We learn, for example, of the natural distribution of the members of this tribe, of which about a dozen species are frequently grown in this country. A graphical representation is provided to illustrate the probable relationship of the different tribes of the family. The second section of the book deals with the genera. A key, naturally rather a long one, is provided. We have tried this key with several of our indigenous genera and met with success. In chapters iv to vi the author deals chiefly with the genera, indicating the distribution, the economic value of the plants, and their

more interesting biological features. The author has frequently found reason to depart from Hæckel's classification (1882). This section will delight the systematist, and serve as a very useful reference dictionary for the genera.

The areas occupied by grassland are large and will repay the close study now being devoted to them, but the problems involved are numerous and complicated; they are closely concerned with such topics—to mention but a few—as the growth habit of the species, their relative aggressiveness, and persistence under grazing conditions where the biotic factor is of the greatest importance. Various types of grassland in all regions are reviewed and space is found for a brief consideration of certain aspects of grassland management. Gardeners will be more particularly interested in the author's remarks about the making of lawns in new tropical countries. The text concludes with a brief mention of the research work in progress, such as breeding new strains of grasses, ecology, and management.

A bibliography of about 400 titles of papers dealing with grasses and grassland will prove of much value; the appendix deals with additions and corrections chiefly concerned with systematic nomenclature made from the notes of other systematists. We are grateful for the index to the genera; the illustrations number 48 and are new. The author has collected and arranged a mass of facts for us. We cannot suggest that he should include more in one volume. The book is primarily one for the systematic botanist and specialist dealing with grasses, although it deals with ecology.

"Patio Gardens." By Helen Morgenthau Fox, with Illustrations by Ralph L. Reaser. 4to. 228 pp. (The Macmillan Co., New York, 1929.) 25s. net.

The Spanish idea of a garden Paradise is a walled enclosure refreshed by green shade and splashing water, a conception which differs somewhat from that of most European people.

In the gardens of Spain there is no pretence about the tutoring of nature. To the Spaniard generally, "Nature" would suggest dusty fields, endless rows of Olive trees and plateaus bounded by stony mountains naked to the burning sun.

English critics of Spanish gardens must forget their own ideals and take into consideration the influence of climate and history upon the habits of the people of the Iberian Peninsula.

Mrs. Morgenthau Fox has written on "Patio Gardens" chiefly for readers in the United States, where wide areas are appropriately conditioned for gardens suited to Spanish ideals. In this country such occasions are rare.

The book should prove none the less interesting to many readers of this Journal, and is specially recommended to those who intend or hope to visit Spain.

The form of garden which rather vaguely we call a Dutch garden, owes something of its character to the Spanish occupation of Holland. It was popularized in this country during the reign of William and Mary.

Spanish garden art has therefore already exercised some influence on English gardens. The examples given by Mrs. Fox are full of suggestions which might be developed to advantage in this country in town gardens and small rectangular garden plots.

"Patio Gardens" is one of the few practical books in the English language on the subject, and should prove useful to amateur and student alike. It contains many charming little illustrations.

"Hausgarten Technik." By K. Poethig and C. Schneider. 4to. 247 pp. (Gartenschoenheit, Berlin, 1929.)

Like all the volumes of this series of German garden books this is admirably reproduced and illustrated, and as carefully compiled. It deals with the technicalities of garden making, the construction of ponds, paths, rock gardens, steps, and so on, and though the planning would not always commend itself to English ideas, the book is well worthy of perusal by all interested in garden construction who also read German.

"The Anatomy of Dessert." By Edward A. Bunyard. 8vo. 134 pp. (Dulau, London, 1929.) 10s. 6d.

Pray, reader, hast thou a soul—gastronomic, of course—and a garden—of fruit, of course? Then read of this book, for thou wilt delight in it. Or, hast thou but the one or the other—nay! even neither—then, too, read it, and thou shalt acquire much merit and preparation for some future day of full possession. There is no other such book dealing with the dessert.

Anatomy connotes the use of knife and skilful eye; Mr. Bunyard selects the pruning knife to clear away unwanted growths, aided rather by palate than by eye. Well do our French neighbours distinguish "fruits d'apparat" for the

exhibition table, but not for the dessert. Flavour and texture are the things that matter in the products of our gardens—though a few exotic products are mentioned intermediately from shops. Of the exotics there is little said—the citrus fruits (including that fraud in name and substance, the so-called grapefruit), the pineapple and some others do not appear; of imported apples, those of Tasmania are rightly the most extolled, though even there that *goût de botte, de cûle, de whatnot* may be present.

Partly by circumstance and partly by design, the writer grows quite a considerable number of the more highly commended apples and pears, hence a sympathetic feeling that great palates must hop like great minds! Our author confesses to the want of a "*Thesaurus verborum de gustibus*" and wanders into French, German and Italian, too, to find his word for *un goût exquis* or an elusive flavour. Insistence is made on the right balance of sweet, sour, and perfume, but some will not agree that too sour an apple "merely means it has been used too early," for the acidity may be actually too much for control by eventual sugar or unctuous pectin. Again, much depends on the proportion of sweet "cane" sugar and the less sweet "fruit" sugars.

Rightly, variations in flavour due to season are noted in warning those who would make "fair judgment of a fruit"; but those due to the mysteries of locality, soil, exposure, *et hoc genus omne*, in the same season are nearly left in silence. Apart from organoleptic characters, the test-tube may reveal monstrous differences within a score of miles in identical variety and coterminous maturity. Until trial has been made, some of the more exiguous may fail to come up to their reputations with consequent regraft or replant; Mr. Blackmore's failures in this direction are noted. 'Orleans Reinette,' which receives the pride of place above all apples, though it comes well here on Old Red drifts, is reported to be poor in the Thames Valley, not far from Reading. 'Comte de Lamy,' "one of the very best of all in the South of England," loses somewhat on our Old Red by an almost unpleasant grittiness (however, see page 101, in exoneration).

One can hardly hint at omissions or exclusions from the limits of a small work, but 'Worcester Pearmain' might well have been allowed to fade into its own evasiveness of real quality in order to give room for mention, additionally, amongst "Cox descendants" of Laxton's 'Exquisite' and 'Superb'; and would not one be as sad without 'St. Edmund's' as without a 'Gravenstein'? diametrically different though they be; and what of 'D'Arcy Spice,' good off the Old Red, as from East Anglia?

Since hints of the kitchen peep through, may we not deplore no side-show of pie of Ribston, as we do deplore when the season brings forth too few to make one?

Next to pears of such giant virtue as 'Comice,' 'Josephine,' and 'Olivier,' we should hardly have expected to find 'Louise Bonne' on calling terms: she may go confer with 'Conference.'

Apricots, Cherries, Figs (our author does not like dried ones, do you? Down south they be very various, almost sugarless, almost seedless amongst others, contrasting with the familiar honey bags of gravel; but Balearic fig-cake freely libated with anis—Oh! oh!), Gooseberries, Grapes (à bas le Grand Maroc! vive le Frontignan!) are all scrutinously dissected. We come to Melons, and call halt a moment—the present writer admits that he would as soon partake of netted, lace, or Persian Melon whilst a Cantaloupe was on the table, as our author would a Cox whilst a 'Reinette d'Orléans' remained. But the Prescotts, whether early or white, should not appear in the same paragraph with nobler 'Noir des Carmes,' with whom 'Bellegarde' or 'Délices de la Table' are worthier companions. Here comes discussion on the judgment of ripeness, as again under Pears; yet only appeal to eye and nose is outlined—surely the *Tactus Eruditus* is the thing—the whole thing, with sniff or squint hardly needed. The skilled finger soon learns the proper spring or resilience at either pole in the Melon, and as for the Pear, grasp it in the whole hand quite gently, when a slight tendency to yield or not to yield may be detected, further a light touch of forefinger near the stalk will reveal "what tidings from within?"—not the perry expert's method, whose thumb, with horse-powers behind it, will gain the core whether blotted or iron hard—no, for us the units of force must be taken in mouse-powers.

Nectarines, Nuts (including the Pecan and the Brazil, whose *socius* might be damson cheese in the absence of Goyabada or Guava cheese), Peaches, Plums (a difficult subject in its wider range), Raspberries, with Strawberries even for the fearsome, to end the learned feast.

Of illustrations, only a frontispiece—from the signature, Napoleonic. Who but a great emperor could command grapes to rest on plain air whilst apples (more grossly cored than Joey Crabs) have newtonesquely fallen; while a deftly cut curl of lemon-rind for some Tom Collins (or is it Horse's Neck) cocktail, a banana and a crumb brush, minus the handle, complete the vigorous foreground.

NOTES AND ABSTRACTS.

[For Index of Periodicals quoted see previous volumes.]

Apple Capsid (*Plesiocoris rugicollis* Fall.) and the Common Green Capsid (*Lygus pabulinus* L.), Observations on the Eggs of the. By M. D. Austin (*Jour. S.E. Agric. Coll., Wye*, No. 26, 1929, pp. 136-144; 4 figs.).—Owing to marked differences between results obtained with certain tar-distillate washes when used against the ova of the apple capsid, it was thought that hardness of wood in some varieties of apple was a factor influencing the results. Shoots from six varieties of apple were critically examined to ascertain where the eggs were laid, the number and the depth of insertion, and the effect of the tissues on the eggs. It was found that hardness of wood had little influence on the depth of egg insertion and thus cannot be expected to have any great influence on the results obtained with tar distillates applied during the dormant season.

Notes are given as to the position and insertion of the eggs of the common green capsid in currant shoots.

Technical descriptions are given of the ova of both species.—G. F. W.

Apple Scab and its Control in N. Ireland. By A. E. Muskett and E. Turner (*Journ. Min. Agr., N. Ireland*, 1929; figs.).—The authors consider the production of winter spores on old leaves the most fruitful source of infection in spring. They had good results by spraying before the flowers opened (the pink stage), and again after petals fell, with Bordeaux mixture (2½ lb. copper sulphate, 8 lb. quicklime, 40 gallons water). The ordinary strength (4:4:40) caused scorching. Burgundy mixture (2 lb. copper sulphate, 2½ lb. soda, 40 gallons water) also gave good results, without scorching, but in some instances scorching has been reported. Lime sulphur is not recommended. The addition of sugar or glue to the Bordeaux mixture improved control to some extent.—F. J. C.

Berberis lycopoides Stapf (*Bot. Mag.*, t. 9102; June 1926).—A species related to *Berberis aristata* but differing in the pale greyish-brown bark, the shorter pedicels and the bluish-black berries covered with white wax, larger than those of *B. Lycium*. It seems closely related to both and to *B. glaucocarpa*.
F. J. C.

Coffee, Arabian. By A. E. Haarer (*Dep. Agr. Tanganyika Ter., Pamph. 2*, 1929).—An account of the cultivation of Arabian coffee in Central Africa, with characteristics of varieties, methods of planting and pruning, and modes of curing and preparing for market. Every phase of the cultivation is dealt with briefly and clearly.—F. J. C.

Dahlia Species, The Genetics and Cytology of. By W. J. C. Lawrence (*Jour. Gen.*, 21, pp. 125-159, August 1929, plate).—Experiments have been made on *Dahlia variabilis* and its chromosome behaviour compared with *D. coccinea*, *D. coronata*, *D. imperialis*, *D. Mazoni* (all of which have 32 chromosomes), and *D. Merckii* with 36. *D. variabilis* has 64, and it is concluded that *D. variabilis* is probably a hybrid between a species carrying ivory-magenta-purple and one carrying yellow-orange-scarlet.—F. J. C.

Diplopoda and Chilopoda and their Allies, The Economic Status of. Part I. By S. G. Brade-Birks (*Jour. S.E. Agric. Coll., Wye*, No. 26, 1929, pp. 178-216; 32 figs.).—The paper comprises a critical examination of some records of *Diplopoda* (Millepedes) and *Chilopoda* (Centipedes), together with an account of original observations and experiments.

The feeding habits and economic importance of both groups are considered in detail. In the section entitled "On Obtaining a Supply of Material" we find descriptions and diagrams of two types of traps, the use of which in millepede-infested gardens will prove a useful means of eradicating these pests.

The economic status of the classes *Pauropoda* and *Symphala* is briefly reviewed.

A key is given whereby the fourteen indigenous species of *Lithobiomorpha* can be distinguished. The conclusions reached regarding the economic importance of the *Chilopoda* are: (1) that members of the *Lithobiomorpha* and *Scolopendromorpha* hold a neutral position between injurious and beneficial animals, for in the presence of large numbers of injurious soil insects and other invertebrates *Lithobius* would have to be reckoned as a true beneficial, but under entirely different conditions, e.g. the presence of numerous earthworms in the soil, the reverse is clearly indicated; and (2) that the case of the *Geophilomorpha* is entirely different, for as an animal-eating group it occupies the same position as the other two classes, but its vegetarian habit makes it positively injurious if present in sufficient numbers with a crop liable to attack.

A bibliography of 7 pages completes the paper.—G. F. W.

Flea-Beetles of Economic Importance, Observations on the Biology of Some. By H. C. F. Newton (*Jour. S.E. Agric. Coll., Wye*, No. 26, 1929, pp. 145-164; 2 plates).—The paper is divided into six parts, viz. (1) The Biology of *Epilix atropae* Foudras, the Belladonna Flea-Beetle; (2) The Biology of *Plectroscelus concinna* Marsh, the Brassy-Toothed Flea-Beetle; (3) The Developmental Stages of *Chaetocnema aridella* Payk.; (4) The Biology of *Psylliodes attenuata* Koch, the Hop Flea-Beetle; (5) The Biology of *P. affinis* Payk., the Potato Flea-Beetle; and (6) *P. chrysocephala* L., the Cabbage Stem Flea-Beetle.

Each species is considered as to previous records, its bionomics and host plants, the nature and extent of injury, control measures and technical descriptions of the immature and mature stages, together with key figures to larval characters.—G. F. W.

Fritillaria Olivieri Baker. By O. Stapf (*Bot. Mag.*, t. 9104; June 1926).—Native of mountains near Hamadan, Persia. Flowering in April and May, hardy; flowers solitary, nodding, externally bright green, with purple-brown margins to outer perianth pieces, yellowish-green without tessellations inside.

F. J. C.

Fruit Tree Red Spider, The. By A. M. Masee (*Rep. East Malling Res. Stn.*, April 1929, pp. 116-122).—A short account is given of the life history and distribution of *Oligonychus ulmi* C. L. Koch. The pest is known as the European red mite in America, where the name of *Paratetranychus pilosus* C. & C. is adopted, but *O. ulmi* claims priority and should be used.

The small globular red eggs are laid during the latter part of September, in October, and in early November upon the spurs and buds and on the shoots and frequently on the trunks and main branches. The young, active six-legged mites emerge during April and soon commence to feed upon the succulent leaves. After three moults the mites are mature and continue to feed on the foliage. After an interval of a few days the summer eggs are deposited on the foliage and shoots. The life cycle during warm weather is very rapid, it being completed within a fortnight, so that several generations overlap.

O. ulmi has a wide range of food plants, seventeen species of plants being recorded as hosts. The most susceptible are apples, plums, damsons, and pears. Varietal susceptibility is evident in that 'Lord Derby,' 'Allington,' 'Worcester,' 'Laxton's Superb,' and 'Orleans Reinette' are among the susceptible varieties of apples, whilst among plums 'Belle de Louvain,' 'Victoria,' and most varieties of damsons are very susceptible.

Symptoms of attack are yellow foliage turning into a greenish-white and finally developing into a silvery appearance which resembles an attack of silver leaf.

Control measures include the application of a sulphur preparation before flowering, when either lime-sulphur (1-30) or liver-of-sulphur wash may be used. The wash must be applied through a coarse nozzle, and it is essential to wet the whole of the foliage and shoots with the spray. One application is generally sufficient, but badly infected trees may have to receive a post-blossom spray which, in the case of lime-sulphur, must be diluted to 1 in 80 or even 1 in 100. 'Stirling Castle' should not be sprayed with any sulphur spray.—G. F. W.

Heterodera schachtii in Lancashire and Cheshire, Investigations on. Part I. By A. M. Smith and E. G. Prentice (*Ann. App. Biol.*, vol. xvi. No. 2, May 1929, pp. 324-339; 4 figs.).—It has been customary within recent years to attribute to eelworm attack the failure of potato crops in many parts of the country. Doubt has been expressed as to the actual part that eelworms take in the disease. It was considered necessary to contrive satisfactory technique whereby the degree of infestation is measured. The direct method is to count

the number of encysted females in samples of soil from infected areas during the winter months.

Results show that there is a positive association of intensity of disease of the plants and the cyst content of the soil in those cases where the disease has been observed recently. On the other hand, where the disease was observed three or more years ago disease and crop failure are always associated with a high cyst content of the soil, but there may be a high infestation without apparent diminution of crop yield. The oft-repeated suggestion that "eelworm disease" may be due to an association of the fungus *Rhizoctinia solani* with *H. schachtii* appears possible.—G. F. W.

Heterodera schachtii in Lancashire and Cheshire, Investigations on. Part II. By A. M. Smith (*Ann. App. Biol.*, vol. xvi. No. 2, May 1929, pp. 340-346).—Investigations carried out in eelworm-infected soils show that an infestation of *H. schachtii* may not be uniform over even a small area. An attempt was made to discover whether any relationship existed between the degree of infestation and the nature of the habitat.

The results show that it is improbable that the rate of reproduction in this species of eelworm is influenced to any marked degree by the normal variations in the physical condition of the soil.

As regards the pH estimations of a large number of soil samples, there is found to be a significant negative correlation between pH and cyst count for fifty-three soils. There is not, however, a significant correlation in the case of the other twenty-five sandy soils.—G. F. W.

Insect Attack, The Internal Condition of the Host Plant in Relation to, with Special Reference to the Influence of Pyridine. By J. Davidson and H. Henson (*Ann. App. Biol.*, vol. xvi. No. 3, August 1929, pp. 458-471).—Part I (6 pp.), entitled "The Nature of the Problems Involved," is devoted to a review of previous work carried out on the internal condition of the food plant in relation to insect attacks. Among the numerous points raised it is stated that resistance or immunity in a plant to insect attack appears to be due to features closely associated with the physiology of the host, probably the presence or absence of particular substances in the tissues which render the plant unsuited to the particular insect. The results obtained by several investigators as to the effect that grafting and inoculation of plant sap and injection of chemical substances directly into the tissues of the plant or indirectly in solution through their roots have on various pests are described in detail.

Part II (8 pp.) deals with an investigation carried through by the junior author entitled "On Soil Treatment with Pyridine and its Effect on the Infestation of *Vicia faba* by *Aphis rumicis*." It is shown that pyridine in suitable concentrations exercises a marked detrimental effect upon the aphides. In sand experiments the effect on the aphides was proportional to the amount of pyridine administered to the plant, whilst the effect on plants growing in soil was far less detrimental, but the concentration had to be much higher than was the case with plants grown in sand.—G. F. W.

Insecticides for Biting Insects, Laboratory Experiments with Non-Arsenical. By C. T. Gunningham and F. Tattersfield (*Ann. App. Biol.*, vol. xv. No. 4, Nov. 1928, pp. 649-658; 2 figs.).—The paper opens with an historical review of the work, chiefly carried out in America and England, of finding non-arsenical substitutes for arsenic compounds in the destruction of mandibulate insects.

The results of spraying hawthorn and black currant foliage with various chemicals and extracts of certain tropical plants against four species of macrolepidopterous larvæ are condensed into the space of two tables.

The silicofluorides of sodium, potassium, aluminium, and calcium used as spray fluids showed considerable promise when used against young larvæ. Considerable and irregular injury, however, was noted which demands further work for the establishment of the conditions under which such compounds may be applied with a margin of safety. Extracts of certain tropical plants, e.g. *Tephrosia vogelii* and Black and White Haiari, had a repellent action to young larvæ, so that with even high dilutions of the extracts the foliage was untouched and the larvæ died of starvation.—G. F. W.

Mamillaria conopsea Scheidweiler. By O. Stapf (*Bot. Mag.*, t. 1901; June 1926).—*M. centricirra* and *Neomamillaria magnimamma* are regarded as synonyms of this plant. Flowers deep rose. Stems succulent, armed with curving spines.—F. J. C.

Mesembryanthemum. By N. E. Brown (*Gard. Chron.*, 1928).—This revision is resumed on January 7, and continued at irregular intervals till February 2, 1929, p. 84.—*E. A. B.*

Mesembryanthemum stellatum Mill. By O. Stapf (*Bot. Mag.*, t. 9103; June 1926).—Regarded as synonymous with *M. barbatum* var. β and *M. hirsutum* Haw. and belonging to the section of the genus characterized by a tuft of radiating bristles on the leaf tips. Native of the Karroo. Early in cultivation. The plant forms a small succulent shrub and bears carmine flowers.—*F. J. C.*

Potato Late Blight, Control in N. Ireland. By A. E. Muskett (*Journ. Min. Agr., N. Ireland*, 1929; figs.).—A comparison of the results of dusting as opposed to spraying against ordinary potato disease is concluded in favour of spraying, for by it much larger crops were obtained at no greater expense than dusting involved.—*F. J. C.*

Primula siamensis Craib. By O. Stapf (*Bot. Mag.*, t. 9100; June 1926).—This is the Siamese counterpart of *P. spicata* and rather larger in all its parts. Native of the Siamese Shan States. A monocarpic species with mauve flowers. Its hardiness is not certain.—*F. J. C.*

Primula, The Genus. By A. W. Darnell (*Gard. Chron.*, March 10, 1928, p. 176, still in continuation throughout 1929).—A useful alphabetical list with "brief, simple non-technical descriptions of all the known species." The name of the species is followed by the authority for it; then the common name, if one exists; and the section to which the species belongs; a brief description, habitat, varieties, cultural notes and references to illustrations.—*E. A. B.*

Pyrethrum (*Chrysanthemum cinerariaefolium*), **Pyrethrin I and II: Their Insecticidal Value and Estimation in.** By F. Tattersfield, R. P. Hobson, and C. T. Gimmingham (*Jour. Agric. Science*, vol. xix. Pt. ii, April 12, 1929, pp. 266-296).—Tests with Pyrethrin I and II show them to be highly toxic to the bean aphid, *Aphis rumicis*. Pyrethrin I was found to be the most toxic substance so far tested by the authors, and the conclusion is that it is mainly responsible for the contact insecticidal value of Pyrethrum.

The methods of estimating the value of Pyrethrum samples are described. The analytical results obtained from a series of samples agreed with their observed insecticidal properties when used against *A. rumicis*. It was found that Pyrethrum powder loses its toxicity after long exposure to damp conditions. Samples grown from the same seed on the same soil are likely to vary within fairly wide limits according to seasonal conditions.—*G. F. W.*

Pyrethrum Experiments. By M. D. Austin (*Jour. S.E. Agric. Coll., Wye*, No. 26, 1929, pp. 124-135).—These experiments are a continuation of those carried out in 1928 (*R.H.S. Jour.*, 54, p. 252). The methods of preparing the plant material and the spray solutions are described.

The results obtained from spraying various plants in the insectary and the field against the attacks of various species of aphides, lepidopterous larvæ, sawfly larvæ, potato capsids, flea-beetles, scale insects, and red spider are described in detail.

It was found that alcoholic extracts were in every case superior to aqueous extracts, and this was most evident in the case of the strawberry red spider. Poor results were obtained with both extracts when used against fully grown larvæ of moths and sawflies.—*G. F. W.*

Red Spider Mite, The. By E. R. Speyer (*Jour. Pomology*, vol. vii. No. 3, Dec. 1928, pp. 161-171; 4 figs.).—*Tetranychus telarius* L. is one of the "key" pests of glasshouse plants, for severe losses are occasioned to growers of cucumbers, tomatoes, and carnations through the effect of immense numbers of mites partially destroying the foliage. Among economic plants, vines, hops, legumes, strawberries, violets, roses, arums, *Asparagus Sprengeri*, salvias, peaches, and nectarines act as hosts, whilst weeds, especially dead-nettle and convolvulus, are favoured food plants.

The symptoms of attack and the effects from feeding are described, whilst facts connected with seasonal habits and the life cycle of the summer generations receive their full share of attention.

Remedial measures are arranged under three headings, viz. (1) fumigants, (2) sprays, and (3) winter treatment. (1) Broadcasting Grade 16 naphthalene at the rate of 6 lb. to 100 ft. run will give complete control in cucumber houses where the temperature can be kept above 74° F. over a period of thirty-six hours and where a highly relative humidity figure is obtainable. (2) An early application of some suitable petroleum emulsion should be applied to the foliage of

cucumber, tomato, and melon plants, replaceable by liver-of-sulphur and soap wash for carnations, the "bloom" of which is removed by oil emulsions. Cucumber and tomato plants should be regularly sprayed with oil emulsion from the end of August till the crop is removed, to prevent the mites from leaving the plants and seeking hibernation quarters. (3) Winter treatment consists of (a) a thorough cleansing of the entire inside of the infested house with cresylic acid and soft-soap emulsion; (b) trapping the mites in dry straw strewn over the ground surface; and (c) the storage in a dry shed of staging when not in use for the propagation houses, the rejection of all cane supports used for staking infested plants, and the raising or removal of the ridge-capping of houses.—G. F. W.

Red Spider and Tar-Distillate Washes. By A. M. Massee and W. Steer (*Jour. Min. Agric.*, vol. xxxvi. No. 3, June 1929, pp. 253-257; 2 figs.).—The authors suggest that the most likely reason for the increase of the fruit tree red spider (*Oligonychus ulmi*) on apple trees which have been sprayed with tar-distillate washes is the destruction or discouragement of some parasitic or predacious insect which normally keeps down their numbers.

Among the several natural enemies of this pest, a small predacious bug, *Anthrenus nemorum*, commonly feeds on red spiders and their eggs, and it appears probable that many of these beneficial insects are killed by winter washing.

The immature and adult stages are briefly described, together with notes on the life history.

The effect of winter washing on the hibernating bugs is that the amount of available shelter in the form of loose bark is removed and that large numbers collected under bark, in crevices on the trunks, branches and support stakes, and amongst dead leaves, grass tufts and other ground rubbish around the trees are destroyed.

The most successful formulæ for combating a serious infestation of red spider are: (1) lime sulphur at 1 in 30; and (2) liver of sulphur 50 ounces, soft soap 5 lb., water 100 gallons. Since these washes are ineffective against the eggs, it is essential to apply them after the majority of the winter eggs have hatched, but before the mites begin to lay their summer eggs, the normal period being in early April until mid-May. Apples should receive a pre-blossom spray during a warm period. The control of red spider on plums is less complete, and is due to the earlier application of the wash.—G. F. W.

Rhododendron Kotschyi Simonkai. By O. Stapf (*Bot. Mag.*, t. 9132; Jan. 1928).—This species of *Rhododendron* from Transylvania is well known in gardens under the names *R. ferrugineum* var. *myrtifolium* and *R. myrtifolium*. It is a smaller plant than *R. ferrugineum* with flowers of clearer rose, and quite as easy to cultivate as the other "alpine roses."—F. J. C.

Ribes and Apple, A Simple Diagnosis of the Plant Lice of. By F. V. Theobald (*Jour. S.E. Agric. Coll., Wye*, No. 26, 1929, pp. 117-123; 2 col. plates).—With the help of two simple keys and two coloured plates the determination of eight species of aphides occurring on currants and gooseberry and eight species on apple is simplified so that anyone desiring to identify the several species may do so with comparative ease.

The species found on the genus *Ribes* are *Amphorophora cosmopolitana* Mason, *A. britteni* Theobald, *Rhopalosiphum ribesina* V. d. Goot, *Myzus lactucae* Schrank, *Capitophorus ribis* L., *Aphis grossulariae* Kalt., *Periphyllus testudinatus* Thornton, and *Eriosoma ulmi* L.

Those occurring on apple are *Aphis pomi* De Geer, *A. rumicis* L., *Anuraphis roseus* Baker, *A. crataegi* Kalt., *A. petheridgei* Theobald, *Rhopalosiphum prunifoliae* Fitch, *Pterochlorus saligna* Gmelin, and *Eriosoma lanigerum* Hausmann.

Keys are given to the apterae and alate viviparous females. Short life-history notes are given under each species and the alternate hosts enumerated.

G. F. W.

Sterilization by Heat of Small Quantities of Soil, The Practical. By W. F. Bewley (*Jour. Min. Agric.*, vol. xxxvi. No. 7, Oct. 1929, pp. 623-634).—The various devices used for the steaming and baking of small and large quantities of soil are figured and described in detail.

The advantages of steaming over baking are discussed, whilst the precautions to be taken before either method is adopted are clearly stated.

The chief sterilizing plants are known as the "Cheadle Royal," the "Sterilatum" apparatus, and Dorey's patent steam soil sterilizer. The most reliable baking plants are the Holmes baking oven and the "Warburton" baking apparatus. Several modifications of these types have been devised and are mentioned.—G. F. W.

Sulphur as a Fungicide and as an Acaricide, The Action of. Part II. By W. Goodwin and H. Martin (*Ann. App. Biol.*, vol. xvi. No. 1, Feb. 1929, pp. 93-103; 1 fig.).—In a previous communication (*Ann. App. Biol.*, vol. xv. p. 623) the authors dealt with the action of sulphur when applied to a heated surface, and it was found that the agent concerned is elemental sulphur generated by volatilization. The present paper deals with the results obtained when two fungi, viz. powdery mildew of hop (*Sphaerotheca humuli*) and mildew on couch (*Erysiphe graminis*), and a mite, viz. the black currant gall mite (*Eriophyes ribis*), were employed.

Accumulative evidence is given to the view that actual contact of the sulphur particle with the fungus is necessary before fungicidal action can occur.

The death of the gall mite is not due to contact with fine particles of sulphur nor to relatively high concentrations of sulphur dioxide or hydrogen sulphide, for these gases do not produce any permanent effect on the animal, but to traces of sulphur volatilized at ordinary temperatures.—G. F. W.

Tar-Distillate Washes, The Value of. By F. V. Theobald (*Jour. Kent Farmers' Union*, vol. xxii. No. 4, October 1927, 3 pp.).—The efficacious results obtained by the use of tar-distillate washes at varying strengths in controlling the greater number of insect pests of fruit trees are recorded. Whereas the various fruit-feeding species of aphides and coccids and the apple sucker are controlled by the use of an approved tar-distillate wash at 7 per cent., the eggs of winter moth and capsid bugs and hibernating larvæ of case-bearers and some tortrices are only partially destroyed.

The author deprecates the inclination of fruit growers to give up the practice of grease banding. Since greases can now be obtained with castor-oil bases, the material may be applied directly to the trunks of standards and half-standards, thus saving time and labour costs in applying the bands. The grease or bands used for the control of the winter moth should be left on and used later for the partial control of apple capsids, migratory woolly aphides, leaf-hoppers, the larvæ of the green pug moth and weevils (*Phyllobius* sp.).

The control of young winter moth and allied larvæ and capsid bugs on bush trees is obtained by an early application of a nicotine-soap wash.—G. F. W.

Tetrachlorethane for Commercial Glasshouse Fumigation, The Use of. By T. Parker (*Ann. App. Biol.*, vol. xv. No. 2, May 1928, pp. 251-257).—The results obtained from a series of experiments carried out over a period of six years under laboratory and commercial glasshouse conditions, using varying concentrations of Tetrachlorethane against a variety of glasshouse pests, are given.

The methods by which the fumigant was applied are explained. The most satisfactory method of applying the material is to impregnate sacks with the liquid and hang them from the wires of the house.

The dose necessary for controlling the nymphal and adult stages of White Flies is 5 fluid ounces to 1,000 cubic feet. Three applications are necessary and should be given at intervals of ten days.

Care must be taken with this material, owing to the possibility of decomposition during storage, with the formation of free hydrochloric acid.

The fumigant is selective in its action, for whereas a high percentage of mortality is obtained with White Fly, two species of Aphides, one species of Mealy Bug and Red Spider are unaffected.

A valuable table is appended whereby the effect on various greenhouse plants may be estimated. Using a concentration of 5 fluid ounces to 1,000 cubic feet, it was found that thirty-six species of plants were unaffected, eleven species were slightly affected, whilst eight species were badly affected.—G. F. W.

Venidium fastuosum Stapf (*Bot. Mag.*, t. 9127; Jan. 1928).—Previously called *V. Wyleyi*, *Arctotis fastuosa*, *A. Wylei*, and *A. mirabilis*, this handsome species has been again introduced from S.W. Africa. The plant is a half hardy annual about 18 ins. high with large bright orange flowers, purple round the disc.

F. J. C.

Violas, A Revision of. By Lt.-Col. E. Enever Todd (*Gard. Chron.*, 1928).—Continued from vol. 82, this admirable and useful revision is resumed on January 21, p. 48, and concluded on p. 8 of the issue for July 7.—E. A. B.

Vlasbrand (Brulure der Lin). By Jikke H. H. van der Meer (*Tijdschrift over Plantenziekten*, 1928, pp. 126-145; plates).—The author shows that typical flax wilt is produced after artificial infection with the fungus *Pythium megalanthum*. Two other fungi to which the trouble has been attributed, *Asterocystis radus* and *Thielavia basicola*, commonly found associated with the wilt, failed to produce the typical symptoms when used as inoculants.—F. J. C.

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MASTERS MEMORIAL LECTURES, 1929. STOCK : SCION RELATIONSHIPS.

By R. G. HATTON, M.A., Director East Malling Research Station.

I.

[Read November 5, 1929 ; Mr. C. G. A. NIX, V.M.H., in the Chair.]

THE practice of building up a tree from two individuals—a rootstock and a scion—by means of grafting and budding is age-old, and in any discussion of the relationship between the stock and the scion of a tree so constructed, the first matter for consideration should properly be the reason which has made this practice almost universal.

From the time of VIRGIL to that of the prolific horticultural writers of the seventeenth and eighteenth centuries, the practice of budding and grafting was widely recommended, though in many cases the reasons for so doing must have been based on legend and tradition rather than upon actual experience. On the other hand, horticulturists had noted the varying performance of trees of a single variety, and had suggested that rootstock might be at least one cause of this, for as THOMAS HITT said : “ Stocks are in some measure a sort of soil to the kind of trees raised on them ” [39].* Further, it is clear that at least during the eighteenth and nineteenth centuries, at any rate in the case of Apples, it was realized that the size of tree and potentialities for early fruit bearing could be influenced by the selection of suitable varieties

* The number in brackets refers to the list of articles on this subject given at the end of these lectures (p. 209).

of rootstock, such as the vegetatively raised 'Doucín' and 'Creeper' Apples. However, only during the latter half of the nineteenth century, when the laying out of fruit plantations made its appearance as a commercial venture, was any serious attempt made to collect definite evidence of the relations existing between rootstock and scion.

The critical investigator may, however, search in vain for any reasoned statement as to why the use of a rootstock should be preferred to the more natural method of encouraging the tree to grow upon its own roots, though it was more or less taken for granted that the act of budding and grafting, causing an artificial "break" at the point of union, had in itself some checking effect upon growth, and accelerated productivity.

TREES ON THEIR OWN ROOTS.

(a) *Methods of Obtaining.*

When, therefore, the programme of work at the Long Ashton and East Malling Research Institutions was discussed in 1912, joint rootstock investigations were one of the main lines of work decided upon, and this naturally included comparative trials of varieties growing upon their own roots and "worked" upon different rootstocks.

At East Malling, an attempt was made by methods of layering to obtain on their own roots a wide range of varieties grown commercially for their fruit. This included a number which were traditionally supposed to root readily. However, it was not until the autumn of 1921 that a sufficient number of one-year rooted layers of four varieties became available to make a start with this experiment.

The experience of these early attempts seems to have given at any rate a partial answer to the question of why the use of varieties grown on their own roots was not common, since, by the methods of propagation then recognized, it proved difficult to induce the majority of such varieties to form roots at all readily.

That this difficulty was more or less generally experienced is suggested by the recent accounts published by American investigators of their various attempts to obtain "own root" apple trees, by adopting their native practice of grafting directly on to an extraneous root, and using this as a "nurse" whilst the partially buried scion gradually formed adventitious roots. After this the nurse root was removed, leaving the scion provided with its own root system [2, 49, 61]. That varieties can be so rooted under English climatic conditions has been shown at East Malling, and is referred to in the Annual Report for 1927 [29]. It also appears that on the Continent a measure of success in the layering of commercial varieties has been achieved by ESBJERG, at the Danish Plant Breeding Station at Blangsted [14]. However, either by layering or nurse-root grafting, a period of at least two years is generally required to establish varieties on their own roots, though "ready rootingness" has proved to be a varietal characteristic.

(b) Subsequent Behaviour.

The early history of series of trees growing on their own roots (by the layering method) at East Malling offers another partial explanation of why trees are not so grown in commerce. As already reported [34], when the comparable one-year-old trees of four varieties were lifted, weighed, and measured, those on their own roots were strikingly less vigorous than budded trees of the same age on the vigorous rootstock No. XV, and they were even considerably smaller than corresponding similar trees on the semi-dwarfing Doucin No. II, both in average height and weight [3]. This would certainly be no recommendation to the nurseryman or inducement to the buyer. Further, although, as will be shown, in some cases these "own root" trees with no "break" at the union have by now caught up the "worked trees," in none did they do so until the fifth year, and this slowness of growth could not be in any way associated with earlier cropping of the "own root" series.

Somewhat similar experiments were carried out at Long Ashton, where unworked rootstocks were used instead of commercial apples, but in this case the material was removed from the nursery at two years old, in December 1924. From this material, BARKER makes the following deductions amongst others: "the size of a worked tree is approximately similar to that of a tree of the scion variety grown on its own roots, if the rootstock used is of a variety of equal or greater vigour; when the rootstock variety is less vigorous than the scion variety, the size of the tree falls short of that standard in proportion to the relative 'weakness' of the rootstock variety" [3]. Now whilst it was possible to draw this deduction at the end of two years after experimenting with comparatively freely rooting rootstocks, it will be recalled that at the end of four years it was impossible to make similar deductions from the less ready-rooting varieties included in the East Malling experiment, although they were chosen as being the most ready-rooting commercial varieties then available. However, from the fifth year to the end of the seventh year, *i.e.* to the time of writing, it became obvious that the "own root" trees were developing with considerably greater rapidity than the trees worked both on semi-dwarfing and vigorous rootstocks. This was shown by the rate of increase of certain characteristics expressing vigour, such as wood growth, cross-section of the stem, and height and spread; though some have not as yet reached the size achieved by the same variety worked on the vigorous rootstock No. XV. From the four varieties studied, it seems that varietal characteristics are of considerable importance in determining the relationship between varieties on their own roots and similar sorts grown on the different grades of rootstock. For instance, while 'Manx Codlin' and 'Keswick Codlin' on their own roots, up to the end of the seventh year, have behaved very similarly to trees worked on the semi-dwarfing No. II, and have not yet in general reached the standard of the trees on the

strong rootstock No. XV, 'Oslin' and 'Early Victoria' have, during the last two or three years, attained the standard of the trees on No. XV, and several trees have already passed it. This is well shown by the accompanying diagrams (see figs. 53, 54 and 55).

This may be partly explained by the fact that the "own root" trees of 'Manx Codlin' and 'Keswick Codlin' have fruited much more freely than the same varieties "worked" on No. XV, whilst of the last two varieties, neither the "own root" trees nor those on No. XV have fruited much or differed from one another to any significant extent. This differential behaviour also seems suggested by the figures presented by BARKER in the behaviour of 'Jaune de Metz'

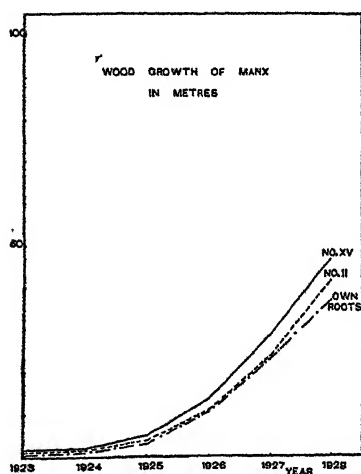


FIG. 53.—COMPARISON OF GROWTH OF "OWN ROOT" AND WORKED 'MANX CODLIN.'

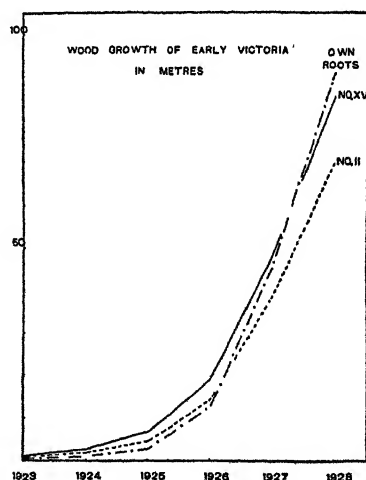


FIG. 54.—COMPARISON OF GROWTH OF "OWN ROOT" AND WORKED 'EARLY VICTORIA.'

(No. IX) unworked and worked on Bristol No. 5, as opposed to the different response of 'Broadleaf' (No. I) similarly treated [3].

Similar experiments with a number of commercial varieties of Domestic Plums, commonly grown locally upon their own roots, were started at East Malling in 1921. They show that, at least in the nursery stage, most varieties grow more vigorously on selected Myrobalan (*Prunus cerasifera*) roots than upon their own, but here again the question of variety has to be considered even though certain varieties in the trial show the tendency of the "own root" trees to excel in vigour once they become established.

Whether it is safe, therefore, to conclude that the deduction referred to is of universal application to deciduous fruit trees, in view of the fact that the experiments are as yet of comparatively short duration, and already give hints at modifications, remains to be seen. There are established cases in other orders, such as those quoted by Yöstr [73], where species of *Solanum* and *Brassica* have grown more vigorously

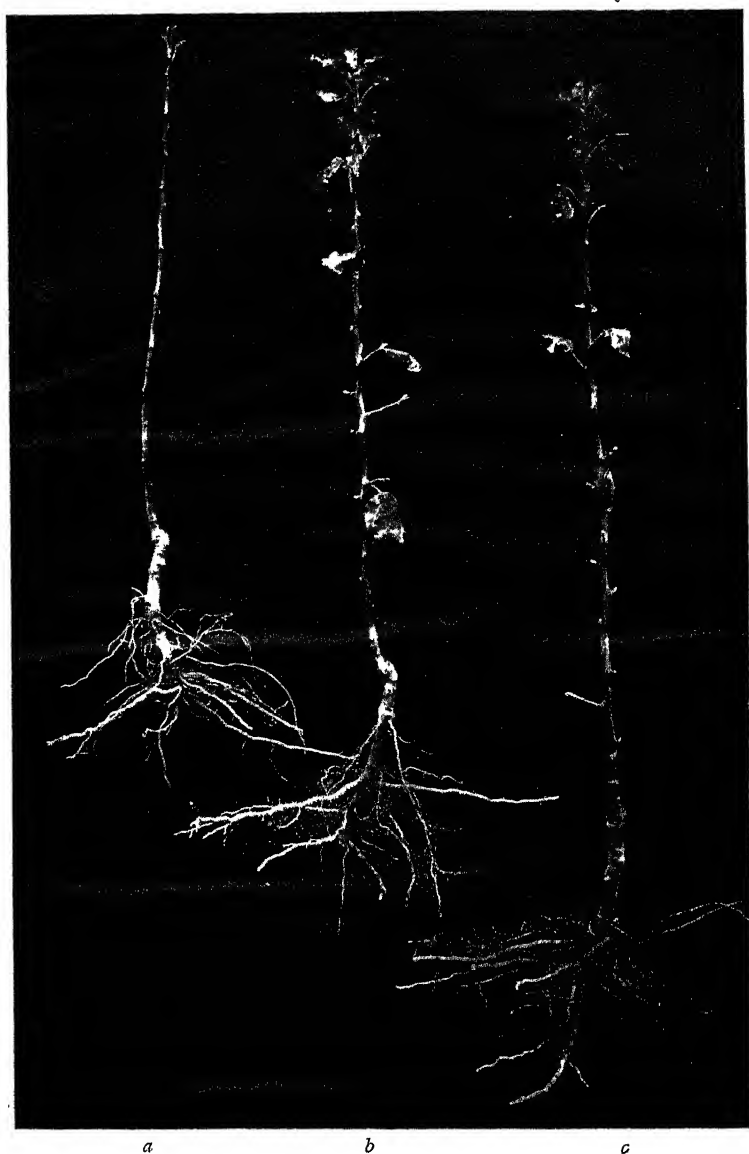


FIG. 55.—ONE-YEAR-OLD MANX CODLIN TREES : (a) ON OWN ROOTS ;
 (b) ON DOUCIN (II) ; (c) ON FREE STOCK (xv).
 (Note poor development of tree on own roots.)

[To face p. 172.



FIG. 56.—BENCH GRAFTING ON PIECE ROOTS DIRECT, AND RESULTING ONE-YEAR TREE.

(No part of the stock stem intervenes.)

when grafted upon root systems other than their own. One fact, however, seems certain, that by growing "own root" deciduous fruit trees the possibility of obtaining degrees of dwarfness and precocity of bearing would be lost, even if the raising of such were in any way easy in practice on a large scale.

It appears then that the initial difficulty in raising, and the length of time necessary to encourage many varieties to take root, together with their subsequent slow development in the early years when so rooted, have combined to make budding and grafting an established practice. Moreover, for multiplying a new variety quickly, every bud becomes available. Later, the dawning consciousness that the behaviour of the tree could be influenced by the rootstock—that in fact a kind of symbiosis must exist between the two individuals (stock and scion), each existing partly upon the products of the other—greatly influenced horticulturists, who, very early in the exercise of their art, had learned that they could not reproduce their chosen varieties true to type from seed.

THE USE OF ROOTSTOCKS.

Since there appears to be at present no obvious reason for, or indeed likelihood of, the abandonment of the practice of budding and grafting, it becomes a matter of both practical importance and scientific interest to consider what rootstocks are in use, what influence, if any, they have upon the scion, and how they may be turned to the best advantage.

(a) *Methods of Budding and Grafting.*

It would be well to distinguish from the outset between practices of Europe and the American Continent in the raising of fruit trees, since apparently contradictory evidence of the interaction between scion and rootstock has been accumulating on both sides of the Atlantic, the explanation possibly lying in the difference in method in common use in these two parts of the world. In Europe, it is the almost universal practice to bud or graft on to the stem of the rootstock, whether it has been raised from seed or by vegetative methods. In England, Apples, Pears, and Plums are commonly budded within a range of 1 to 3 inches from ground level, although there has always been a tradition that so-called dwarfing stocks require budding lower than seedlings, which latter were all assumed to induce vigour in the resulting tree. The horticulturists on the American Continent have, on the other hand, largely resorted to bench grafting in winter, a method in which the scion is placed in direct contact with whole, or pieces of, seedling roots (fig. 56). Probably these contrasting methods have arisen owing to climatic and economic differences. Whilst it is possible to raise root-grafted trees in this country, they very rarely attain a salable height in the first year, and unless special precautions are taken, a large

percentage of the scions have established themselves on their own roots by the end of the second year [29]. Naturally, once they have so established themselves, any control of the behaviour of the tree through rootstock is lost.

Apart from the obvious differences in practice which the harder winters in America would encourage, as explained by GARDNER, BRADFORD, and HOOKER [12], the tendency to scion rooting of bench-grafted trees (where the seedling root becomes unimportant or dies) is thought desirable because the seedling roots are very variable as regards winter hardiness, whereas the adventitious roots of varieties that are hardy make them more uniformly resistant to winter injury. Again, "Cion rooted trees may prove superior in other localities because of their persistence or spread or depth or other qualities" [12].

During a visit to the Eastern States of America in 1923, the writer had the privilege of seeing large batches of these "own rooted" trees in the storehouses of a very large nursery, and was informed that varieties were far more easily distinguished by the uniform character of their roots than by the characteristics of the scion. The distinct types of rooting of different varieties were obvious, as was only to be expected, since the original nurse roots had in most cases become subsidiary to the scion roots (fig. 57).

In other words, the real difference between the two methods lies in the fact that the American grower attempts to reach a standard of uniformity by growing "own root" trees, and so forgoes the practical value of rootstock influence, while the European grower, where he has attempted to arrive at any measure of uniformity, has done so by standardizing his rootstocks. Again, in many parts of the Dominions the use of 'Northern Spy' has ensured standardization of performance, but whether an altogether desirable performance in many cases may be questioned.

It seems hardly necessary here to stress further the desirability of raising trees, uniform in size, cropping capacity, and even other attributes, such as roothold, both for the commercial grower who is planning his orchards with any degree of foresight and precision, and for the research worker who must know something of the potentialities of his material [30].

The discussion of the influence of the rootstock, as utilized in Europe, falls very conveniently into the two categories: (1) the seedlings, such as "crab" and "free" stocks, and (2) the vegetatively raised rootstocks, such as the so-called 'Paradise' and 'Quince.'

(b) *Seedling Rootstocks.*

In practice, all this class of stock is raised from open pollinated fruits, sometimes of a single named variety, but far more often from a heterogeneous collection of cider and perry fruits. Sometimes the seed, especially for Plums and Cherries, is collected from so-called

wildings in their native habitats—and this “wilding” nature was also supposed to distinguish the “crab” from the “free” Apple stock.

Even supposing that it might be possible to obtain seed from self-pollinated fruits, the complicated build up of the vast majority of our heterozygous tree fruits would have ensured variability amongst the progeny, whilst the free play of cross-fertilization could produce no other result.

Although it might be presumed that the vast majority of such material would prove immensely variable in all characteristics, the horticultural tradition grew up that, since these seedlings had an initial tap-root, they were therefore deeply rooted and *ipso facto* strongly anchored in the soil, and, as a consequence, the producers of vigorous growth.

Soon after the programmes of Long Ashton and East Malling were drawn up, a close examination was made of the root systems of large collections of Apple free stocks at Long Ashton; and the great variability in the character of such root systems was reported on by BARKER and SPINKS [4]. Contemporaneously, WELLINGTON and the present writer formed a collection of seedling stocks which manifested any signs of “burr-knotting,” in the hope that these would in due course root readily and form new families of so-called ‘Paradise’ or dwarfing stocks, since these burr-knots are potential roots, and their presence was supposed to be the sign of ready rooting. These trees were planted out on their own roots to test their natural vigour of growth, it being thought at the time that the vigour displayed by the rootstock was itself probably mirrored in any scion subsequently worked thereon. The immense variation in all characters ultimately exhibited by these seedlings has been fully described [21].

Variability shown in Young Trees on Seedling Stocks.—These variations in root type, vigour, and nearly every other character, naturally made investigators wonder how far such variations affected the behaviour of scions worked upon seedling stocks; and if any serious effect was proved, whether a grading of seedling stocks, either by their vigour or their root types, would form a basis for improved uniformity in the subsequent trees. Despite what has already been said about American practice, several investigators have presented data demonstrating the undoubted variation in both their nursery and orchard trees, which they attribute, at least in part, to the use of seedling stocks, whilst the claim of other American writers that they cannot discern this variability has already been accounted for by the predominance of the scion roots over the nurse roots when bench-grafted trees are in use. ANTHONY and YERKES, for instance, after making a comparison of ‘Stayman’ trees budded in European fashion upon seedlings from various sources and upon vegetatively raised clones, showed where the number of trees warrant a true comparison, the considerably greater uniformity of the latter [1]. At the same time it is obvious that only by very accurate grading of the rootstocks can complete uniformity be hoped for even where clone stocks are used.

Where older trees were concerned, as far back as 1922 SAX and GOWAN made a study of the variability, both in productivity and habit, in a large orchard of 'Ben Davis,' growing apparently under identical environmental conditions. After making tree to tree observations, it appeared that several factors were involved, and from the frequent grouping of unproductive trees in particular areas, they deduced that 65 per cent. of the unprofitable trees were due to soil conditions, whilst about 35 per cent., where unproductive trees were surrounded by productive ones, were attributed to unfavourable seedling rootstocks [57].

A year later they reported upon an orchard which had been planted half on seedling French "crab" roots and half on clonal 'Tolman Sweet' roots; and though they found that in both cases the early differences in size remained relatively permanent, "the only known factor which might cause permanent differences in size was the variability of the seedling root systems" [58]. ROBERTS, however, whilst conceding that 'Doucin' (vegetatively raised stocks) produced slightly more uniform trees than seedling stocks [51], emphasizes that in grafted trees he has found the position of the bud on the scion to be a very potent factor in early growth variation [52]. BENNETT, on the other hand, finds no such effect [6].

In this country it is often stated that little or no variation is found in the standard trees of grass orchards, especially in the West Country, but here it must be remembered that the common practice is to plant out standard trees (on 6-foot stems) which have stood in the nursery for a minimum period of three years, but generally for four or five, and that, in consequence, there has been a conscious elimination of the weaker growing trees on seedling stock which have not attained to the required height and stoutness for the purpose in view. In other words a grading of the trees has taken place.

A visit to any nursery bed of standard trees upon seedling stocks will amply demonstrate this point, and the writer was privileged to take numerous measurements and counts in large commercial nurseries confirming this.

Variability in Maturing Trees.—So far as the writer is aware, no definite experiments have been laid out in this country with Apples, for the particular purpose of securing any accurate data as to the comparative variability of mature trees on seedling and clonal rootstocks, though there is a considerable amount of circumstantial evidence pointing to the greater variability of trees stem-worked on seedling roots.

In the fruit-growing areas of the East and South-East, where the growing of bush trees has been largely developed, the recommendation that the weaker growing varieties of Apple should be planted on seedling stocks even for bush purposes has afforded ample demonstration of the range of variability to be found. It should be borne in mind that these trees are usually planted out for bushes at one, or at most two, years old, and that the inherent variability in both size and cropping

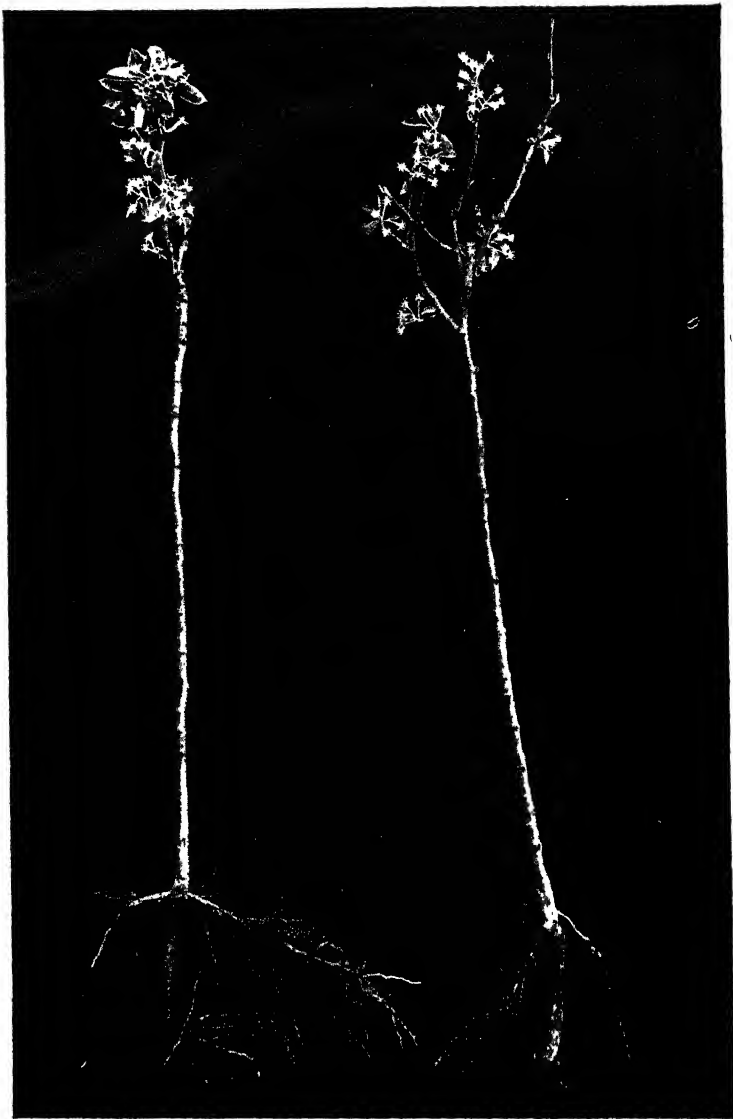


FIG. 57.—YOUNG 'DR. JULES GUYOT' AND 'DURONDEAU' PEARS, WORKED ON INCOMPATIBLE QUINCE. THE STOCK HAS BECOME SUBSIDIARY AS THE SCION ROOTS, AND IT FINALLY DIES.

(The top whorl of roots is from the scion.)

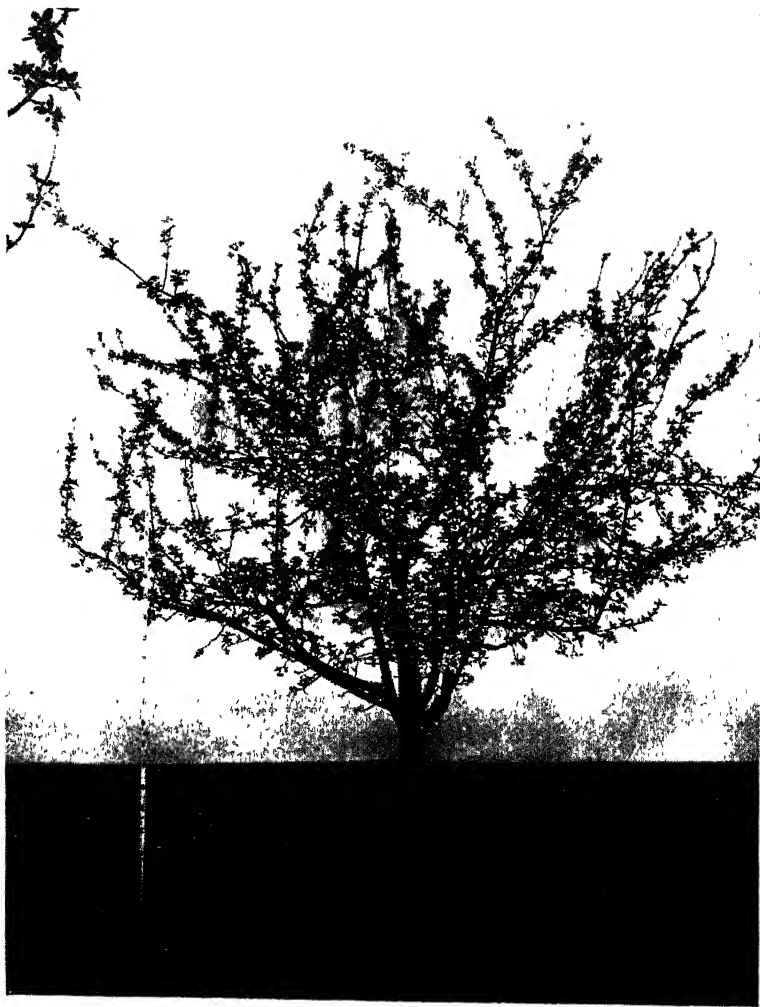


FIG. 58.—LARGE FOURTEEN YEAR-OLD 'EARLY VICTORIA' APPLE
ON SEEDLING ROOT.

(Compare variations in size, etc., figs. 59 and 60.)



FIG. 59.—MEDIUM FOURTEEN-YEAR OLD 'EARLY VICTORIA' APPLE
ON SEEDLING ROOT, ADJACENT TO TREE IN FIG. 58.
(Compare figs. 58 and 60.)



FIG. 60.—A POOR DWARFED FOURTEEN-YEAR-OLD 'EARLY VICTORIA' APPLE
ON SEEDLING ROOTS, ADJACENT TO TREES IN FIGS. 58 AND 59.
(Compare figs. 58 and 59. As one-year-old trees these three looked alike.)

only becomes evident with the increasing age of the trees. Some of the experiences with mature trees, bought from ordinary trade sources, on both Crab and Paradise stocks and forming the pruning plot at East Malling, have been cited elsewhere. In particular the behaviour of some 16 fourteen-year-old 'Early Victoria' Apple trees grown upon seedling French Crab and a similar adjacent series grown upon trade Paradise has been compared (figs. 58, 59, 60). Although, as one-year-olds, the trees on seedling stocks had been carefully graded for size, they have exhibited double the amount of variation in growth compared with the series on vegetatively raised stocks. The amazing differences in the cropping of the individual trees on Crab demonstrate how economically important the variation in material so raised may be. It is hardly necessary to stress the importance of this to the horticultural investigator who has to plan experiments in the field.

In the same plantation it has been possible to make many further comparisons between trees of four other varieties on Seedlings and Paradise. In spite of the fact, ascertained from the identification of suckers from the roots, that the Paradise were not infrequently mixed, and that certain cultural treatments, such as potash manuring of half the trees, have tended to make the trees on these particular varieties of Paradise more variable, there is not a single instance where the sets of trees on seedling Crab are the more uniform, and in some they have proved definitely the more variable.

The history of another series of Apple trees at East Malling, worked to test the suitability of certain layered "free" stocks for half-standards, affords some interesting evidence. Four clonal families of layered stocks and seedlings from three sources were worked side by side in the nursery with 'Lord Derby.' The measurement of their heights as one-year-olds pointed to all the seedling sets as being more variable than those on vegetatively raised roots, with one possible exception where the clone was of a type slow to establish itself. At the end of two years, similar measurements demonstrated the position even more strikingly. It also showed that some sources of seed were undoubtedly more variable than others. Twelve even trees nearest to the average performance in the nursery were then chosen from each set, for planting in their permanent positions. Incidentally the greater number in the seedling sets permitted of more rigorous selection. After six years *in situ* the trees on seedling stocks are still significantly more variable than those on vegetatively raised stocks, and inspection shows that they are more variable in their habit and type of growth and earliness of leaf fall as well as in measurable characteristics such as height, spread, and girth of stem. The coefficients of variability based on the girth measurements of the trees on the four series of clonal rootstocks were 4.3, 3.1, 3.3, and 3.2, whilst those in the two series of trees on seedlings were 6.2 and 11.7.

However, only Apples have been touched upon so far in regard to the variable effects of seedling stocks upon such characters as vigour

and productivity. Pears, Plums, and Peaches also exhibit variability, but in these cases not only are vigour and productivity influenced, as in Apples, to a varying degree, but also very definite incompatibilities are not infrequently found, when clone races from individual seedlings of such rootstocks as "Free" or "Wild" Pear, 'St. Julien,' 'Black Damas,' and 'Myrobalan' Plum stocks have been budded with certain varieties, and their subsequent behaviour in the nursery and the plantation compared.

At East Malling, after thousands of Free and Wild Pear stocks had been closely examined, it was found possible to divide them with some

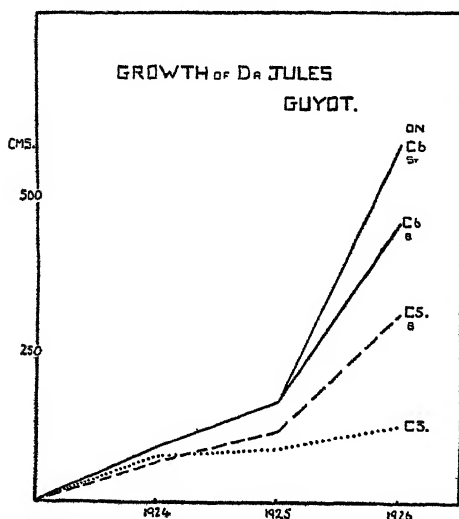


FIG. 61.—GROWTH OF PEARS ON DIFFERENT "WILD" PEAR STOCKS.

accuracy into what appeared to be fairly definite groups, on the basis of botanical character of leaf and wood. Several individual plants, representing the range of variation within each group, were carefully selected and propagated by layering. The subsequent clonal races were worked with a single variety of Pear, 'Dr. Jules Guyot,' for comparison. Even before the trees left the nursery the story of seedling Free Pear stocks was plain to see, for not only were startling differences in vigour and incompatibility evident within the whole range, but they

were equally apparent amongst families of stocks chosen for their close botanical resemblance (fig. 62).

The behaviour of three-year-old trees on three vegetatively raised representatives of Group C illustrates the point well by their average weight at the time of transplanting. The majority of those on "C 6" grew so vigorously that they were suitable for standard trees, the average weight of which was 1.08 kilo. Those on a small grade of the same selection were formed into bushes weighing 0.62 kilo. None of the trees on "C 5" was sufficiently vigorous for a standard, and the average weight was 0.40 kilo. Though the one-year-old trees on "C 3" actually made better maidens than those on "C 5," they made practically no further growth, and their average weight at three years old was 0.23 kilo. This is well shown in the accompanying diagram (fig. 61).

Similar work has been carried out on the 'St. Julien,' 'Black Damas,' and 'Myrobalan' Plum Seedlings which are in such common use in Europe, and the results leave no possible doubt that many of

the nurseryman's unsatisfactory "takes" of buds and of the grower's unsatisfactory trees are manifestations of different degrees of incompatibility inherent in seedling variation. This has been shown to hold good not only for English conditions [30, 35], but also by HOWARD and HEPPNER [40] in their studies of the behaviour of Peaches on a large number of clonal varieties of the species 'Myrobalan' and 'Mariana.'

Despite these facts, there is still arrayed the serious opposition of practical nurserymen all over the world to the adoption of a much wider application of the principle of vegetative reproduction of fruit tree rootstocks. Because the fruit grower has a strong tendency to buy the inexpensive tree, the nurseryman claims that the stock must be raised cheaply, and there is no question that seedling rootstocks fulfil this demand. The reply that the nurseryman can, by avoiding variability and incompatibility, in a large measure produce a higher percentage of salable trees, even in a shorter time, as for example has been shown by GRUBB in the case of Cherries worked on *Prunus Avium* stocks [17], and can charge more for trees of known potentialities, does not appear so far to have been found convincing by the tree raisers. This is probably due in part to the fact that, with the possible exception of some forms of Paradise, unmixed vegetatively raised stocks, carefully graded, have not been available in large enough quantities to demonstrate practically their own worth; in part to the fruit grower being always tempted to buy the most vigorous-looking young tree, which generally speaking can undoubtedly be more easily obtained on the vigorous representatives of sexually produced material, although the eventual performance of such trees cannot be predicted. If the fruit grower would realize that it is much easier to improve the propagation of a rootstock of good performance than to improve the performance of a less desirable one, which happens to be easily propagated, his demand would promote the supply of standardized trees and outweigh the nurseryman's natural objections.

Attempts to obtain True Lines from Seed.—Hence various attempts have been made to grade unworked seedlings, to select the seed from particular varieties or first crosses, and to make use of such factors as parthenocarpy and self-pollination in the hope that, by such methods, the uniformity of trees on seedling rootstocks might be improved. Once again, neither in England nor in America does the grading of seedling rootstocks by the initial vigour seem to have met with great success: for although sometimes it is perfectly true that the vigorous or dwarfing looking rootstock will tend to make the scion vigorous or vice versa, it has been proved that this is by no means always the case. A notable example is shown in the behaviour of scions worked on the very dwarf 'Holstein Doucin' (Malling No. IV), which have within the writer's experience invariably grown into large trees. Another interesting example is that of the strong growing 'Northern Spy' of America, which, when used as a rootstock under English conditions, falls into the semi-dwarfing class [26]. The

account given by SWINGLE of his experiences with very carefully graded seedlings is a typical instance. He says: "Starting with commercial Apple seedlings of extreme uniformity at the end of their first year, a tremendous size range was found by the end of the third year" [68].

With regard to the raising of true lines of seed, little work as yet seems to have been published, though certain varieties of Apple, such as 'Ananas,' of Pear, such as 'Pieter van Huig,' and Plum, such as 'Kroosjespruin,' have been claimed to produce seedlings more or less uniform in appearance and vigour. As far as the present writer can see, this claim, at any rate for the last two, appears to be based on very superficial evidence. DAHL and JOHANSSON have published the results of an experiment which "was expected to give some indication as to whether plants raised from a certain variety should prove to be more suitable as stocks for Apple trees than others." Up to the present they have found a lack of uniformity between seedlings, a possible cause for this being a suggested correlation between weight of seeds and vigour of seedlings. Here again the unexpected has happened, and vigorous varieties such as 'Belle de Boskoop' and 'Gravenstein' have, in general, given very weak seedlings, whereas 'Reinette Ananas' and 'Bismarck' have given the strongest seedlings. Only one vigorous variety, 'Akerö,' gave strong seedlings [9].

KOLESNIKOV'S investigations upon parthenocarpy and self-pollination in Apples, Pears, Plums, and Cherries does not give much encouragement to the seeker after such seed as will germinate in quantity [46].

Even investigators working upon Citrus fruits, despite the fact that they have the opportunity of reducing variability by the use of a proportion of seedlings from parthenogenetically produced seed, report on the variability of seedling rootstocks and its effect on the scion [70, 71].

It therefore appears that the standardization of trees, stem-worked on seedling stocks, even for such a simple character as vigour, is still far distant, and that in the meantime the best choice must lie between the tree growing upon its own roots and that growing upon a vegetatively raised rootstock of known potentialities.

(c) *Vegetatively Raised Rootstocks.*

As far back as 1915, HEDRICK, as the result of noting the variable performance of trees on seedling stocks, expressed the opinion "that one of the things most to be desired in Apple growing is a vigorous standard stock of constant habit. Such a stock will probably have to be propagated from cuttings or layers" [38]. In forecasting this future development, he was certainly ahead of the common European tradition that stocks raised from layers or cuttings were always surface rooted, and *ipso facto* of a dwarfing nature.

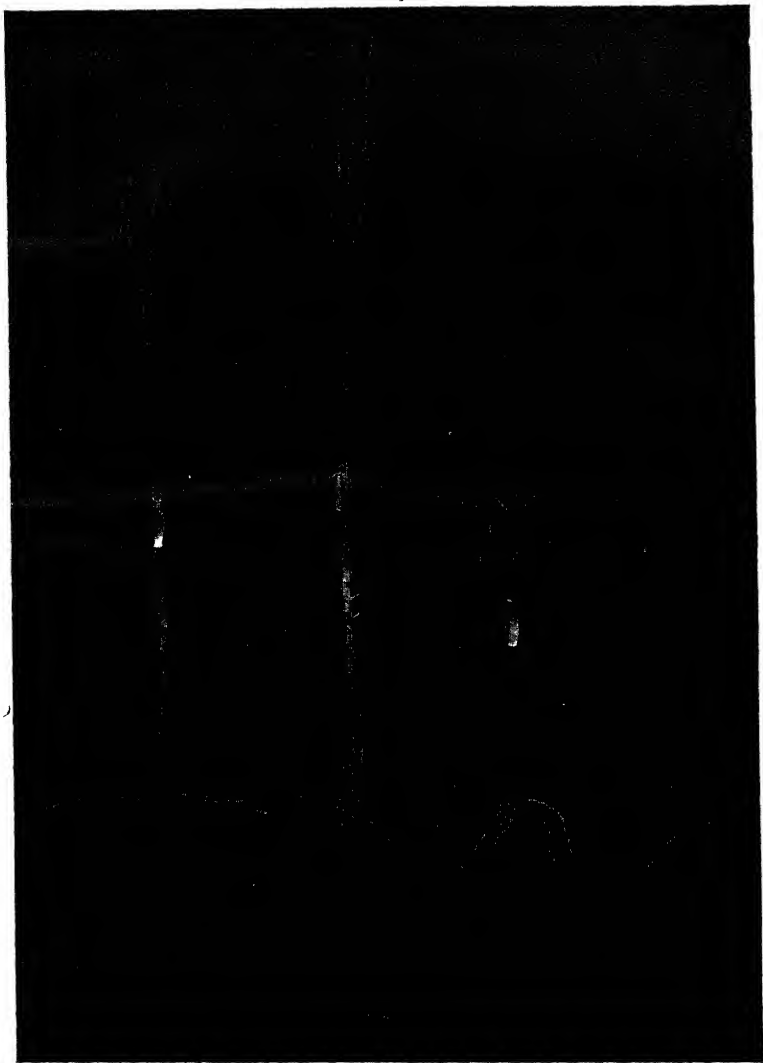


FIG. 62.—TWO-YEAR-OLD 'DR. JULES GUYOT' PEARS ON SELECTED
VEGETATIVELY RAISED SEEDLING PEAR STOCKS.
TYPES C6, C5, AND C3.

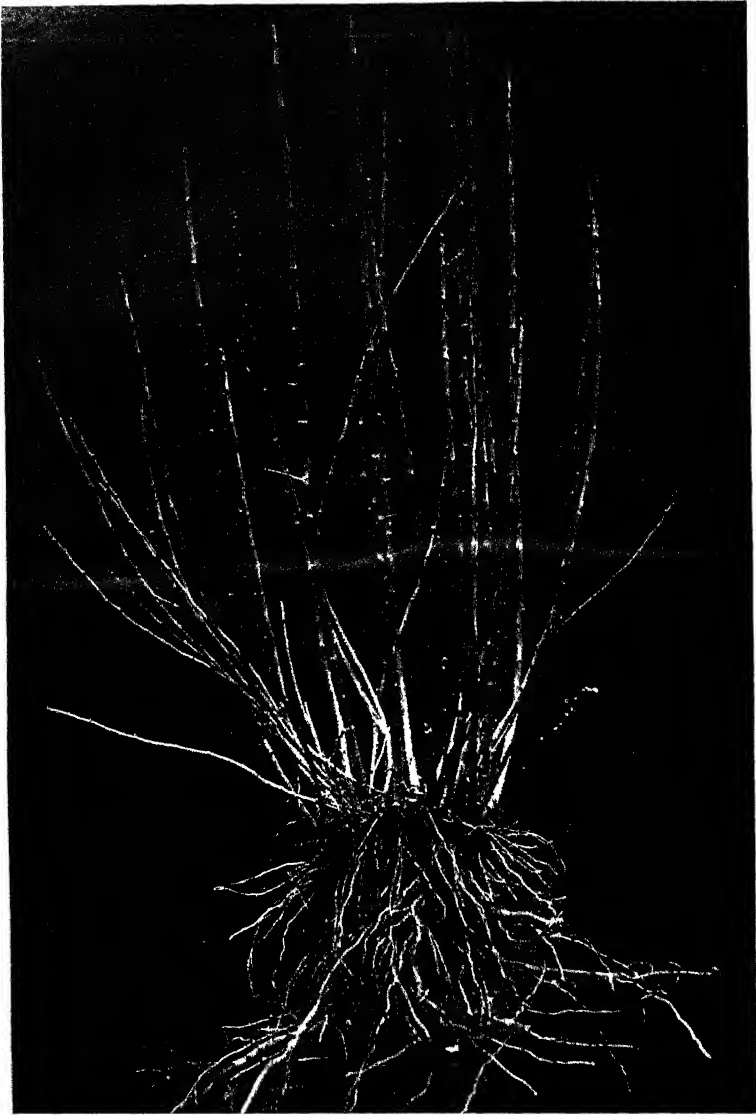


FIG. 63.—VEGETATIVE REPRODUCTION.
THE STOOLING METHOD FOR EASY SUBJECTS, SHOWING UNCOVERED SHOOTS
WITH ADVENTITIOUS ROOTS.

[To face p. 181.

The vegetative propagation of rootstocks is in no sense a modern introduction. The writings of European horticulturists from the seventeenth century onwards are full of references to the use of cuttings, layers, and suckers. However, in horticultural practice the use of vegetative propagation was largely confined to the raising of the so-called Paradise stock, which was supposed to be dwarfing, and to have at least some common source of origin, to the Quince rootstocks, used for dwarfing Pears, and to a few varieties of Plum stock, such as the 'Brussels,' largely grown on the Continent, and the 'Mussel' and 'Common Plum' which were practically confined to English nurseries.

The recommendation to use vegetatively raised material is based on the belief that it is possible from any original seedling plant to reproduce the parent indefinitely by the process of taking cuttings or layers, maintaining unimpaired all the characteristics of the original plant.

Evidence has shown that there is very little apparent vegetative mutation going on in the deciduous fruit stocks; indeed, no single instance has been discovered, after a period of sixteen years of raising a wide range of Apple, Pear, Plum, and Cherry rootstocks by these methods, at East Malling. It is now fully recognized to be possible, from a single desirable plant, to raise a true race or "clone" capable of carrying on the parent's potentialities. Provided the methods of propagation are properly carried out and the health of the plant studied, there is no reason to suppose or, as far as the writer knows, evidence to show that this method of reproduction *per se* involves a gradual deterioration in spite of the common impression to the contrary. One of the oldest forms of layered stock, the true 'Doucine' (No. II), commonly mentioned by French writers at least two centuries ago, affords an excellent example of health, hardiness, and vigorous growth to-day [10].

It was upon this aspect of the Apple rootstock problem that investigations were started at East Malling in 1912, when representative collections of the Paradise Apple stocks of Europe were gathered together, and their botanical characters in both summer and winter carefully described, in the hope of finding a method of classification and of determining the nature of these so-called Paradise stocks. Three publications from East Malling showed how it was possible to distinguish at least nine varieties of Paradise in common circulation in Europe, and at least as many more in course of introduction [18, 19, 20].

It was also demonstrated that they showed a wide range in vigour and habit of growth and in the characters of their fruits, and it became apparent that the word 'Paradise' meant nothing more than a collection of varieties vegetatively propagated, the original parents of which had exhibited signs of a ready rooting habit. It was, moreover, gradually impressed upon the investigators that the different sorts described were not in fact merely "types" of a single family, but were really a collection of vegetatively raised plants, the original parents of

which were distinct varieties of the species *Pyrus Malus*. BUNYARD traced the history of a number of the varieties thus classified [7], to which East Malling had attached its own identification number in order not to be sidetracked into disputes upon nomenclature. The numbers so given in no way relate to the vigour of the stock, but merely to the order in which the clone races were isolated and described. Although there were in commercial circulation a number of these families still true to variety, yet, unfortunately, in many of the stock-raising areas they had become badly intermixed and the nomenclature hopelessly confused. It was not until the end of 1917 that this work on the Paradise Apple stocks was completed, and it was a year later before a sufficient number of trees grafted thereon became available for planting out in order to test the influence of these individual varieties of rootstock.

Almost contemporaneously with the initiation of this work in England, SPRENGER [62] at Wageningen and SCHINDLER [59] at Pillnitz had started independently to sort out the Apple rootstocks in circulation, but it was not until after the war period that they were able to publish evidence confirming and supplementing the English findings.

The Quince stocks in use for producing bush Pears [22], and the rootstocks in common use in Europe for Plums and Peaches [24], were similarly examined at East Malling and clone races established as soon as the classification was complete. At a later date, clone races of Free Pear stocks [30] and of different species of Cherry stocks [17] were established and in due course worked with different varieties of scion.

Methods of Propagation.—Since methods of vegetative propagation have been extended to a far wider range of species and varieties of deciduous fruits, it is necessary to refer to the methods of propagation used, and to the investigations into such methods which are being pursued, before summarizing the indications of stock influence upon scion which have already been established upon worked trees.

Quite early in the life of the experimental nursery at East Malling, it was found that varieties, even apparently closely related, responded very differently to the methods of stooling and layering in common use. Thus, in order to make the propagation of the more difficult subjects by vegetative means a practical proposition, other methods of asexual reproduction had to be developed. For instance, whilst most Apple stocks respond readily to ordinary stooling methods (fig. 63), more difficult ones may be obtained by layering (fig. 64); whereas most Plums are reproduced best if the base of the shoot is etiolated, which process is easily accomplished by a light earthing over even before the buds begin to break. Others are very readily multiplied by root cuttings, and here and there varieties can be reproduced very cheaply from ordinary hardwood stem cuttings. Others again root most readily from soft-wood cuttings. If only the underlying principles which encourage this adventitious rooting could be fully elucidated, the arguments in

favour of seedlings, as against asexually produced rootstocks, would be largely met. KNIGHT and WITT, working along these lines, have dealt with the varietal, seasonal, moisture, and aeration factors [41, 45], and a detailed summary of the methods in practical use has recently been published [44].

Two facts seem to stand out quite clearly—first, that it is possible to propagate asexually any rootstock which is considered to possess desirable qualities, and secondly, that the progeny so produced eventually take on not only the aerial features of the parent but also reproduce the characters of its roots. None of the Paradise stocks in commercial circulation possesses what is generally known as a tap root, which is popularly associated with young seedlings; but many of them are deep-rooted and possess a perfect anchorage in the soil, though these two characteristics are by no means necessarily complementary. It is more than doubtful whether the original tap root of the seedling persists in the majority of cases [4], and even if it does, its virtue as an anchor would appear to be very doubtful from a casual survey of our picturesque West Country orchards with many of their standard trees offering very indifferent resistance to the wind. At any rate, vegetatively raised rootstocks, with both shallow and deep rooting tendencies, with spreading or restricted root systems, can be multiplied at will.

Not only is this possible, but the elimination of undesirable stocks which show incompatibilities and produce physiological or pathological troubles, and are unavoidable amongst seedlings, is the natural outcome. Apart from the influence of external conditions, such as soil heterogeneity, which undoubtedly contribute to variability in tree performance (and which from the experimenter's point of view, by the use of modern methods of plot arrangement, may be to a large extent accurately estimated), there appear to be only three other explanations for the variation of a single variety raised upon clone stocks: (a) the variation in size of these stocks at planting; (b) differences in the bud or graft unions; (c) the capacity of the scion (bud or graft) for variation.

(a) It is well recognized, both by American and English investigators, that the larger one-year tree even on a clone stock tends in vigour of growth to remain larger than its smaller brother on another member of the same clone. Yet it must be remembered that the uniformity which is being sought is not one of vigour alone, since there is every proof that other attributes, such as precocity in fruiting or the reverse, are not materially altered by the size of the one-year tree or even its subsequent growth performance. For instance, the influence of the 'Jaune de Metz' Paradise (No. IX) upon the cropping of the scion is now universally accepted, and there is no mistaking the habit of growth and type of fruit of Apple trees on that rootstock. Yet when the data for annual wood growth came to be critically examined, there appeared frequently a greater percentage variability within the limited size of these trees than was to be found in trees grown upon any

other clonal rootstock so far tested at East Malling. Similarly, even a small tree upon a free-growing layered rootstock, such as Malling No. XII, never, in the absence of complicating factors, exhibits earlier fruiting than is normally associated with No. XII, and will retain the excellent anchorage typical of that rootstock and make relatively vigorous growth [3].

(b) The extent to which the inevitable differences in graft and bud unions affect the growth of the subsequent trees upon clone rootstocks has not yet been fully measured. Some American writers claim that the position of the top bud on the graft [52], and the potentiality of the bud to start growth early or late, may affect the size of the young tree and hence, at least to some extent, its later development [56]. In a recent paper ROBERTS advances further theories about the manipulation of budding and grafting, and states that "it even appears probable that the commonly reported uniformity of nursery trees on clonal stocks is the result of the method of grafting rather than being due to the stock used" [52a]. But since, in this country, the same methods are used both upon clonal stocks and seedlings, and the much greater variation of trees of seedling stocks is still apparent, it would appear that further investigation of these questions of method is still desirable. Ample data have already been published [31] to show that series of trees, worked on to the stem of various rootstocks, are influenced by those rootstocks in exactly the same direction whether budded or grafted, so that under these conditions there is no evidence that the manipulation in any way masks stock effect. The case may not be the same where different species are interworked, such as the Pear on the Quince, or various Domestic Plums interworked with species of *insititia* and *cerasifera*, since here it seems apparent that a "good" or "bad" union may permanently affect the size and even length of life of the same variety on a clonal stock [32, 16]. In cases where there is any question of incompatibility between stock and scion, it has been found that, whilst it was difficult or impossible to get a good permanent union by budding, this can be obtained by grafting.

Much evidence on defective graft unions in the Apple and Pear has been published by BRADFORD and SITTON [6a].

(c) The question of how far variability can be still further reduced, or the desirable characters of any individual tree perpetuated through scion selection, has long exercised the minds of horticultural investigators. In England there have been of course authenticated cases of bud mutation in deciduous fruits, but in the main these variations are rather in the nature of minor characteristics such as fruit colour, and are so few and far between that the probability of serious variation being due to this cause has not been very deeply investigated. However, as GLEISBERG [13] emphasizes, a lookout for such "sports" must be kept both amongst clonal stocks and scions. That mutations of this sort can be standardized, and a new variety produced, is of course undisputed, but whether scions taken from the most and least productive trees of a variety, and from different parts of these trees, can

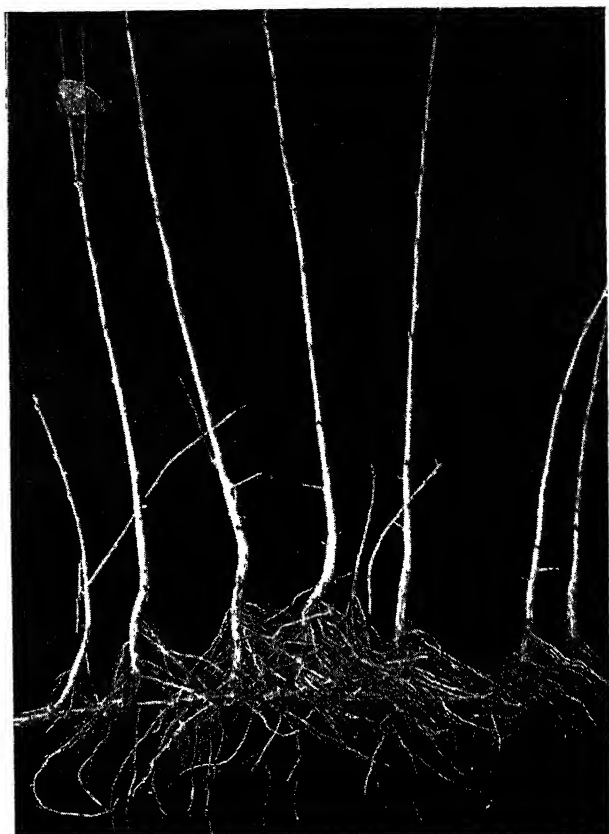


FIG. 64.—VEGETATIVE REPRODUCTION.

THE LAYERING METHOD FOR MORE DIFFICULT SUBJECTS.

(One-year-old growths from layered branch each separately rooted.)



FIG. 65.—'COX'S ORANGE PIPPIN' AT THREE YEARS OLD
ON 'JAUNE DE METZ (IX) PARADISE.'
(Note characteristic spreading habit induced by this stock.)

reproduce those characteristics or not, would still appear to be a somewhat open question. Perhaps the most suggestive results in favour of selecting scions from the heaviest yielding trees are those of MACOUN [48]. In spite of a high variation induced by use of seedling rootstocks, he was able to show a significant difference between the average yields, over a period of nine years, of two sets of trees, the scions of which were taken from the heaviest and poorest yielding trees in an orchard of 'Wealthy' Apples. SAX, on the other hand, was not very successful in obtaining vigorous one- and two-year-old trees when scions from his vigorous productive trees were worked on seedling rootstocks [55].

As far back as 1918, CRANDALL [8] reported upon a series of experiments designed to discover whether the selection of buds of different sizes and from different parts of the tree gave different results when used for propagation purposes. Growth curves showed a negative result, and the conclusion was drawn that all buds from healthy shoots are of equal value for purposes of propagation, at least so far as growth of tree is concerned.

Similar indications have been obtained at East Malling from buds both selected and taken at random and placed upon clonal rootstocks.

Many other instances could be quoted, but despite the commercial tradition in America regarding pedigreed nursery trees, a far greater weight of evidence would be necessary before this idea received a scientific backing in the case of deciduous fruits.*

The findings of SHAMEL [60] and other workers with regard to bud variation in Citrus fruits appear to have no parallel in deciduous fruits.

When the East Malling rootstock experiments were laid out, this possibility of scion variation was borne in mind, to the extent that all the scions were taken from one or more trees known to bear a good fruiting record.

II.

[Read December 10, 1929; Mr. E. A. BUNYARD, F.L.S., in the Chair.]

THE work of description and classification of the so-called Paradise (or vegetatively raised Apple stocks) revealed, by 1917, some seventeen varieties which were apparently readily distinguishable by botanical characters of wood, leaf, etc. Pomological differences, in such features as relative vigour of growth, ease of rooting, and even susceptibility to disease, were also obvious, whilst the young trees of these rootstock varieties upon their own roots manifested very different potentialities for early cropping. In order to discover whether it could be argued from the behaviour of such stocks that the scions worked thereon would be similarly influenced, a scheme was inaugurated in the winter of 1918-19.

* [See also RAWES, A. N., in this JOURNAL, 47, p. 163.—ED.]

In the first instance, sets of trees of three varieties of Apple, 'Lane's Prince Albert,' 'Worcester Pearmain,' and 'Bramley's Seedling' (chosen as representing weak, medium, and strong growing sorts), were both grafted and budded upon the complete range of root systems, so far as material would permit. Of 'Lane's Prince Albert' two successional plantings, the one of grafted and the other of budded trees, were made in the seasons of 1918-19 and 1919-20. Approximately 1,200 trees were involved in these plantings. As is shown elsewhere [31], the results of the larger unit of budded trees have been very generally confirmed by the smaller unit of grafted ones, planted a year previously, so that there will be no reason to refer again to the question of differential effects upon the scion of budding and grafting on to the stock stem. It is also worth noting that the different seasonal conditions at planting have not permanently altered the relative behaviour of the trees on different rootstocks in this trial.

As was anticipated, the earliest indications of stock influence were to be found on 'Lane's Prince Albert,' a variety recognized to be early cropping. So striking was rootstock effect on both vigour of wood growth and upon axillary fruit bud formation that, as early as 1920 [23], it was possible to make certain general predictions for that variety, and to some extent for 'Bramley's Seedling' also. The predictions at the present time require in the main only modifications of detail, which a study of the relationships of growth, cropping, etc., from year to year in most instances will explain. On the basis of these early indications a classification of Apple stocks into four broad groups according to vigour was made :

- (a) Very dwarfing.
- (b) Semi-dwarfing.
- (c) Vigorous.
- (d) Very vigorous.

This classification was to some extent supported also by the early indications of fruit-bud formation, the "very dwarfing" group (a) apparently falling into line with tradition in the immediate production of large numbers of fruit buds, especially "axillaries," whilst the "very vigorous" group (d) showed little or no such tendency. Though it was then stressed that these indications might not be permanent, and might become more accentuated or the reverse as the interactions of growth and cropping became more acute, this general grouping, based mainly on actual length of wood growth and initial weight, was adopted "for convenience" sake and to give a broad indication to the grower of general utility" [25]. This grouping, from features of wood growth and fruit bud formation, has since formed the main standard by which stock influence on different varieties of scion has been primarily judged. It has, however, become increasingly obvious that, quite apart from such measurable characters as length of wood growth and count of fruit buds, certain stocks stamp upon the scion an unmistakable conjunction of characters which are self-evident to the pomologist,

even though they may be difficult of expression through numerical data. For instance, it has already been pointed out that whilst not infrequently the trees of a single variety worked on 'Jaune de Metz' Paradise (No. IX) may show considerable variation in actual total wood growth and crop weight [31], yet the many characteristics associated with No. IX—such as its spreading habit, frequent occurrence of bifurcating growths resulting from terminal fruit productions, slender main stem, number and prominence of axillary fruit buds, swelling at point of union, brittleness of roots, and general robustness (to say nothing of secondary characteristics such as size, colour, and apparent early maturity of fruit)—mark out the trees without any hesitation as being worked upon a single rootstock. To anyone with experience this could only be the influence of 'Jaune de Metz.' At the other extreme, the very vigorous layered stocks, from the first, exhibit a complete contrast in almost every particular to these characteristics, yet one so strong that, in absence of actual numerical evidence, the writer was early emboldened to class stocks such as Nos. XV and XVI as "very vigorous." This, the records of later years have shown in the majority of cases to be correct (figs. 65, 66). These instances could be multiplied almost indefinitely, and apply equally to stock effect on Plums [35], and in any discussion on stock influence this "average performance" must form an essential part of the picture.

Early in 1926 it was possible to review the accumulated records for a single variety, 'Lane's Prince Albert,' at seven years old, and to measure the results statistically and compare them with the early predictions [31]. In the case of different expressions of vigour, such as total wood growth, girth of stem, height, and spread of branches, the differences between the four groups which had originally been described proved to have persisted, and certain representative individuals of each group were still significantly different from each other. On the other hand, whilst the majority of the rootstocks, originally chosen as illustrating the group most clearly, had retained their position, there were cases where unexpected change in behaviour called for modification in grouping. The outstanding case was that of the supposed "very vigorous" No. X which, probably owing, in part, to an unsuspected propensity for heavy cropping, fell off in vigour in later years. Time has now shown that this very vigorous start made by No. X applies over a wide range of scions which later slow down in growth. It is a definite rootstock characteristic shared to some extent by No. XIII. Nos. XVI and IV are typical examples of the reverse tendency. After transplanting they start away slowly and become more and more vigorous as time goes on. It was further shown that between the outstanding types there was an almost complete series of intermediates—with one notable exception of the "very dwarfing" class, which stood alone. As might have been expected, there were some annual fluctuations amongst these intermediate varieties, which, whilst forming connecting links betwixt any two significantly different types, brought them nearer to one or other in

any particular year. Whilst the stocks conveniently ranged themselves around the four group types, *i.e.* Nos. IX, II, I, and XII, in respect of vigour, it was discovered that the old tradition of a negative correlation between growth and cropping, whilst true in some cases, was by no means applicable in others. For instance, in the "vigorous" group (c), stocks Nos. I, VI, and VII, whilst being approximately similar in wood growth, gave the following crop figures respectively: 65, 40, and 105. If these stocks had been regrouped on a cropping basis they would certainly not have been bracketed together, and would probably represent two, if not three, significantly different fruiting performances.

Again, in the "very vigorous" group (d), No. IV had a cropping figure of 73 up to the end of the seventh year, whilst Nos. XVI and XII had a figure of only 17 and 10 respectively. Although, up to that period, these discrepancies in cropping within any one "vigour" group had not disturbed the grouping, it appeared obvious that if the heavy cropping of some varieties continued it must ultimately react upon growth performance.

It is now possible to review the behaviour of these trees for a further period of three years, *i.e.* up to the end of 1928, and thus to see how far any striking modifications of the 1925 position have to be made. Since it has been found impossible to continue the taking of all the measures of vigour, previously referred to, upon the complete series of trees on every rootstock, the annual recording of height and spread of branches and girth of stem has, in many instances, had to suffice,

TABLE I.*

Relative order of "Vigour" of 'Lane's Prince Albert' as expressed by girth measurements.

Order of stocks according to total wood growth, 1925.	Order according to girth measurements.	
	1925-26.	1928-29.
	Mm.	Mm.
1 IX	1 109	1 162
2 III	3 175	2 285
3 II	2 173	3 289
4 V	4 186	6 299
5 X	6 199	4 290
6 VII	5 190	5 298
7 I	7 207	9 333
8 XIII	8 209	7 328
9 VI	11 214	11 342
10 XV	9 210	8 332
11 IV	10 212	10 334
12 XVI	12 224	12 362
13 XII	13 237	13 375
14 OF 5	14 235	14 376

* The braces in these tables indicate similarity of performance—*i.e.* the difference between the mean performances is less than twice the standard error of the difference and is therefore not significant. Some data have already been published relating to the variability of this material, and the whole subject is in course of review, preparatory to the issue of a further report.



FIG. 66.—THREE-YEAR-OLD 'COX'S ORANGE PIPPIN' ON ROOTSTOCK XIII,
SHOWING TYPICAL UPRIGHT HABIT.

[To face p. 188.

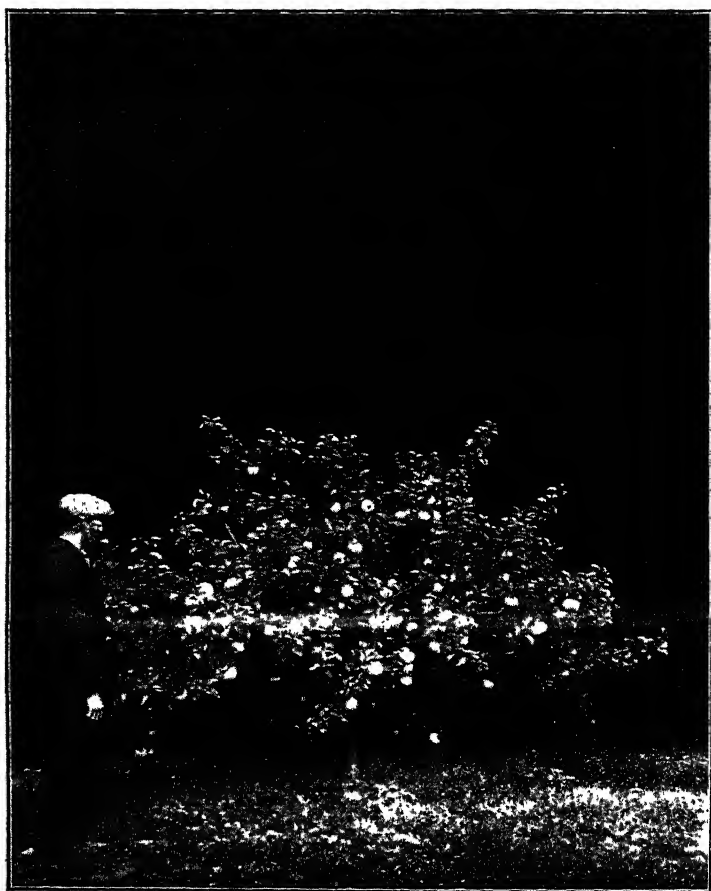


FIG. 67.—'BRAMLEY'S SEEDLING' AT TEN YEARS OLD
ON 'JAUNE DE METZ (IX) PARADISE.'
(Cf. fig. 68.)

although it is realized that no one measure of this nature can give a complete picture of the tree's "vigour." In order to see what modifications have taken place since 1925 the girth measurements at that date and in 1928 will be compared and will demonstrate the effect of the subsequent history of the trees upon this very sensitive expression of vigour.

Table I is encouraging in that it shows only a single instance in which the trees of 'Lane's Prince Albert' on any rootstocks have changed their positions markedly so far as girth is concerned. The trees on No. X are outstanding as having lost four places in girth, a phenomenon which might be explained by exceptionally heavy cropping in the intervening years. On the other hand, trees on Nos. I, VII, IV, and IX have cropped as heavily during the same years and have maintained their girth increments. The actual measurements in millimetres, given in Table I, show that in the vast majority of cases the changes of place are totally insignificant.

On eight of the principal rootstocks—Nos. IX, II, I, VII, X, IV, XVI, and XII—it has been possible to continue recording the new wood growths annually, and, apart from the exceptional performance of the trees on No. X already referred to, the relative positions of the trees on the other stocks have been maintained, within the four groups, as shown in Table II.

TABLE II.

Total wood growth of 'Lane's Prince Albert' on various rootstocks in metres.

1925.		1928.		
IX	46.9	IX	136.6	Group a
II	109.2	X	327.0	Group b
X	133.8	II	388.5	
VII	148.8	VII	424.9	Group c
I	159.2	I	548.2	
IV	201.1	IV	620.3	Group d
XVI	220.3	XVI	772.5	
XII	233.2	XII	810.4	

Indeed, not only are the original differences being maintained, but in many cases they are becoming enhanced, some of the intermediate stocks now differing significantly from the group representatives on either side of them.

Scion Modifications.

The initial grouping of the stocks, and the present discussion, have so far been based almost entirely upon the behaviour of our two series of trees of 'Lane's Prince Albert.' Although similar data concerning wood growth, cropping, and other characteristics have been automatically collected year by year on trees of 'Bramley's Seedling,' 'Worcester Pearmain,' and later on 'Cox's Orange Pippin' and

'Stirling Castle,' no comprehensive review of the figures and indications has hitherto been possible. In 1923, however, the average figures of the records taken on 'Bramley's Seedling' for wood growth, girth, roothold, blossom-bud formation, and fruit set were presented—though not statistically examined—upon typical representatives of the four groups of stock, i.e. Nos. IX, II, I, and XII [28]. These figures appeared to fall into line with the early indications given by 'Lane's Prince Albert,' both as regards vigour and cropping capacity, and a general inspection of the experimental plots seemed to suggest that trees on most of the other varieties of rootstock would again fall into an intermediate position, though the unusual behaviour of the trees on No. X early manifested itself. At the same time the writer pointed out that these same stock effects were not necessarily transmitted to varieties other than 'Lane's Prince Albert' "with the same intensity," nor were the same stocks necessarily "to be recommended as *suitable* for all varieties" [27]. It is now possible, for the first time, to present a much fuller picture of the behaviour of these four additional varieties and to compare their history on the series of rootstocks already tested with 'Lane's Prince Albert.' Unfortunately it was found impossible to keep a record of annual wood growth on the vast majority of these trees after 1924, and two years later this record had to be abandoned even upon trees on selected types of rootstock. The rate with which the recording increased, and the elimination of leader tipping, called for by the habit of these two varieties, made the operation an almost impossible one.

Table III gives a comparison of the new shoot growth of five scion varieties at five years old—the last occasion on which these measurements could be taken throughout. Sixty-five different combinations of stock and scion are represented, and when these wood growths are compared with the original grouping it will be seen that there are ten instances in which trees on particular rootstocks have deviated strikingly from the performance of 'Lane's Prince Albert,' and this strongly suggests a differential effect when combined with different scion varieties. Most striking of all is the case of No. II which appears in the "semi-dwarfing" group for 'Lane's Prince Albert,' takes an intermediate position with No. I for 'Bramley's Seedling' and 'Worcester Pearmain,' and enters the "very vigorous" class for 'Cox's Orange Pippin' and 'Stirling Castle.' As will be seen later, this does not necessarily mean that the other attributes usually associated with this stock have been changed. The performance of trees on No. X again varies remarkably with the particular variety; whilst 'Lane's Prince Albert' and 'Worcester Pearmain' on No. X were still vigorous at this age, 'Bramley's Seedling' from the beginning had made little growth and looked "unthrifty" thereon, whilst 'Cox's Orange Pippin' and 'Stirling Castle' were little better. No. X appears to afford the nearest approach to an incompatible rootstock with certain scion varieties. In one instance, i.e. when worked with 'Bramley's Seedling,' No. XIII, instead of appearing as a very

TABLE III.
Total wood growth of five-year-old trees of varieties on a series of rootstocks.

Original grouping.	'Lane's Prince Albert,' Stock No. Metres.	'Bramley's Seedling,' Metres.	'Worcester Pearmain,' Metres.	'Cox's Orange Pippin,' Metres.	'Stirling Castle,' Metres.
IX ^a II III V } ^b VII ? IV I } ^c VI X XIII XV } ^d XVI XII OF 5	IX 19.3 III 25.3 II 27.0 V 29.7 VI 34.4 I 37.3 X 38.6 VII 38.9 XIII 40.0 XV 40.7 IV 44.6 XVI 45.5 XII 50.4 OF 5 56.2	X 20.7 IX 21.6 XIII 26.3 VI 28.5 III 28.5 VII 29.2 V 29.3 X 30.1 II 31.5 I 34.0 XVI 36.2 IV 36.3 OF 5 41.1 XII 46.3	IX 16.7 VI 22.2 V 25.6 III 28.2 VII 29.0 I 29.8 X 30.0 XIII 30.6 II 31.1 XV 36.3 OF 5 37.0 XVI 40.5 XII 47.0	III 20.4 IX 23.8 VI 25.1 V 28.8 X 28.0 I 29.8 XVI* 33.1 XIII 34.8 II 36.5 XV 42.3 IV 43.9	IX 9.4 VI 12.0 X 19.1 IV 21.3 XVI 21.7 V 21.9 I 22.1 XV 25.9 XIII 27.4 II 28.1

* At eight years old these trees have actually passed those on No. II in wood growth.

vigorous stock, takes quite an intermediate position, but in view of the fact that a number of other varieties on this stock, such as 'Newton Wonder' and 'Allington Pippin,' are making vigorous half-standards, it would seem that a particular varietal preference is again indicated. In the two cases where the "very vigorous" No. XVI appears in an intermediate position at five years (worked with 'Cox's Orange Pippin' and 'Stirling Castle'), the peculiar habit of the stock, which is normally slow in growth for the first few years, has been temporarily accentuated. A study of Table IV, which gives the girth measurements a year later, shows that in 'Cox's Orange Pippin' it is now increasing at a greater rate than the trees on both Nos. I and II.

Finally, there are twenty-one other instances in which stocks have not entirely conformed to the original grouping, in that, with different scion combinations, they have either taken up an intermediate position or actually passed over into an adjacent group.

Table IV presents the picture for a selected number of stocks up to the end of 1928, girth measurements here forming the basis of comparison for the reasons already stated.

TABLE IV.

Vigour as expressed by girth to end of 1928—on certain rootstocks.

Original grouping.	'Lane's Prince Albert.'* Metres.	'Bramley's Seedling.'* Metres.	'Worcester Pearmain.'* Metres.	'Cox's Orange Pippin.'† Metres.
a IX	IX 162	IX 279	IX 189	IX 144
b II	II 289	X 309	X 271	I 172
c I	X 290	I 410	I 281	
d X	I 333	II 417	II 310	XVI‡ 198
XIII	XVI 362	XVI 428	XVI 317	II 201
XII	XII 375	XII 456	XII 344	

* These three varieties were ten years old.

† The trees of 'Cox's Orange Pippin' were eight years old.

‡ In rate of girth increment these trees have now passed those on No. II.

Again, whilst at the extreme ends the types of the "very dwarfing" and "very vigorous" groups show little fluctuation, the intermediate groups, represented by Nos. II, X, and I, still show that scion variety, at any rate judged from the point of view of vigour, does qualify rootstock performance.

The crop record of these five varieties is given in Table V for six-year-old trees and brought up to date in Table VI. Although here again the interactions of particular stocks and scions are well illustrated, the thesis that the general cropping character of a rootstock is not necessarily changed by variations in vigour is largely borne out. Table V shows that the representatives of the different groups which were thought to induce more or less precocity in cropping have practically without exception fulfilled this anticipation. The somewhat exceptional behaviour of trees of 'Worcester Pearmain' is in all probability due

TABLE V.

*Fruiting figure * on different rootstocks in the first six years.*

Original grouping.	'Lane's Prince Albert.'	'Bramley's Seedling.'	'Worcester Pearmain.'	'Cox's Orange Pippin.'†	'Stirling Castle.'†
a IX	IX 61.0	IX 59.9	IV 36.8	IX 11.2	IX 13.4
II	VII 30.6	IV 25.7	II 30.9		
b VII	II 20.2	I 21.9	IX 29.4	II 1.6	IV 3.8
IV	IV 17.0	II 21.2	I 22.8	III 1.0	V 1.9
III	III 13.9	VII 20.4	VII 17.8	V 1.0	
V	V 11.0	V 12.0	X 14.6	I 0.7	I 0.6
c VI	VI 11.0	VI 9.1	XII 11.3	IV 0	VI 0.5
I	X 11.0	III 8.8	XVI 11.0	VI 0	II 0.5
X	I 10.8	XV 2.4	III 10.4	X 0	XIII 0.3
	OF 5 4.5		OF 5 10.2		
d XIII	XIII 3.8	XIII 1.7	XV 9.6	XIII 0	X 0
XV	XV 3.5	XVI 1.0	VI 9.4	XV 0	XV 0
XVI	XVI 1.9	XII 0.4	V 6.5	XVI 0	XVI 0
		OF 5 0.1			
XII	XII 1.3	X 0	XIII 5.4		
OF 5					

* Number of fruits a tree—note all trees are planted equidistant, whereas to visualize possible crop from an acre varying distances, according to vigour, would have to be allowed.

† The figures for these two varieties are not available for the complete series after four years, but at six years 'Cox's Orange Pippin' cropped on IX 38.4; II 13.8; I 10.3; XVI 0.

TABLE VI.

*Fruiting figure * on different rootstocks up to end of 1928.*

'Lane's Prince Albert.'†	'Bramley's Seedling.'†	'Worcester Pearmain.'†	'Cox's Orange Pippin.'†
IV 91.9	IX 169.9	IV 97.9	IX 10.5
X 90.0	II 144.4	I 81.4	II 10.3
		OF 5 80.9	
VII 84.5	I 144.3	III 80.7	I 3.3
I 75.1	VII 142.6	II 79.4	
	OF 5 127.2		
IX 72.7	IV 117.5	XVI 69.9	
XIII 68.4	III 101.6	XII 67.4	
VI 60.8	VI 89.5	XV 64.0	
III 58.3	V 87.3	IX 63.1	
II 56.5	XV 74.4	X 53.9	
OF 5 55.7			
XV 54.1	XVI 73.2	VI 50.9	XVI 0
XVI 53.6	XIII 66.3	VII 50.3	
V 43.3	XII 50.5	XIII 49.9	
XII 22.7	X 21.5	V 48.0	

* In lb. of fruit from a tree.

† These three varieties are ten years old.

‡ 'Cox's Orange Pippin' trees are eight years old.

In 'Bramley's Seedling' and 'Worcester Pearmain' only the trees on stocks indicated by *block type* are strictly comparable—trees on other stocks have received lighter pruning treatment from winter of 1925-26.

to the particular habit of cropping of this variety in its early years and the special method of pruning used for this variety, which is known to fruit readily on longish laterals in which the strong trees on Nos. XII and XVI abound. On the other hand, the trees on Nos. IX, II, and I produced a mass of axillary fruit-buds which often drop out and rarely come to fruition on 'Worcester Pearmain.' This, at any rate, is a possible explanation of why the 'Worcester' trees on "very vigorous" stocks have cropped more nearly like those on the dwarf and semi-dwarf stocks than is the case with any other variety.

Table VI shows the cropping positions, four years later, when presumably the trees even on the more vigorous stocks are approaching the stage when their cropping capacity can be gauged.

Once again the influence of individual scion variety is very much apparent. Thus, whilst 'Lane's Prince Albert' and 'Worcester Pearmain,' naturally early-cropping varieties, have on many of the more vigorous stocks now caught up and surpassed trees on the dwarfing groups, 'Bramley's Seedling' and 'Cox's Orange Pippin,' naturally slow or shy in cropping, have not yet reached the point when the much larger trees on the vigorous groups have borne a full crop. When they reach this point they will naturally surpass the smaller trees individually. It is not a matter for discussion here whether a large number of small trees or a small number of large ones will produce a heavier crop from an acre eventually.

As the records have accumulated and it has been possible to examine them, the evidence in favour of the theory of particular stock and scion partialities hinted at in 1926 [27] has been strengthened beyond all doubt. As was then stated, whilst the general behaviour of varieties other than 'Lane's Prince Albert' suggested that the initial grouping would prove of wide application, "some (varieties) are affected relatively more and others relatively less." It is now possible to go one step further and to claim that in exceptional cases, such as 'Cox's Orange Pippin' on No. II, or 'Bramley's Seedling' on No. X, particular partialities, at any rate in the matter of vigour of tree, may cut across the general classification. It now appears evident that the broad recommendations made to the grower in 1924, although they must suffice for a considerable number of years to come, will require to be supplemented, as was suspected as far back as 1923 [28, 33], by a list of these particular partialities as opportunity offers for testing every new combination of stock and scion. The general principles laid down at that time, and again later in 1927, when the characteristics of each individual stock were summarized in detail, will be seen to apply even more widely when the data upon the effect of local conditions, such as soil and climate, come to be considered. Quite apart from the behaviour of the five varieties used for making comparisons of root-stock influence at East Malling, there are large collections of other varieties on Groups *a*, *b*, and *d*. Whilst no strict comparison is possible with such material, it can be said without hesitation that every variety worked upon Group *a*, *i.e.* Nos. IX and VIII, has

evinced all the unmistakable qualities associated with this group, even the recalcitrant 'Northern Spy' fruiting in its fifth year. Again, whilst there is a distinct variation in the vigour of trees on the semi-dwarfing Group *b*, those on No. II have almost invariably shown early fruit-bud formation and weak anchorage, whilst the undesirable qualities of No. V have been only too patent. A number of varieties are also being tested as half-standards upon layered free stocks (Malling, Nos. XIII, XV, XVI, XII, and Long Ashton OF 5) in comparison with trees on No. I and on selected seedlings, and they are well maintaining their reputation for vigour. Finally, it is obvious that different scion varieties respond in different degrees to a dwarfing and a very vigorous rootstock. It will be readily seen, for instance, that the gap between 'Lane's Prince Albert' on No. IX and No. XII is considerably larger, and is indeed annually becoming greater, than the gap between 'Bramley's Seedling' on the same two rootstocks. This is well illustrated in Table VII.

TABLE VII.

Ratio of size of trees on No. XII to trees on No. IX.

(Size expressed by total wood growth.)

Year :	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.
'Lane's Prince Albert'	1.7	1.8	2.0	2.6	3.8	5.0	5.2	5.1	6.1
'Bramley's Seedling'.	2.0	2.0	2.1	2.1	2.6	3.2	3.5		

Thus at seven years old, whilst the trees of 'Lane's Prince Albert' on No. XII had produced five times as much wood growth as those on No. IX, 'Bramley's Seedling' had produced approximately only three times as much. On the other hand, as has been already illustrated (see Table VI), although at the time of writing the effect of No. IX on cropping is still more pronounced on the slow-maturing varieties ('Bramley' and 'Cox'), in actual fact the influence of this stock on precocity of fruiting was more quickly secured on 'Lane's,' a weaker-growing early-maturing variety (figs. 66, 67).

Experiments concerned with the testing of different rootstocks for Plums with different scion varieties demonstrated that there could be a rough grouping of the stocks into those usually having semi-dwarfing, intermediate, and invigorating effect; nevertheless there were once again indisputable signs of stock-scion partialities cutting across this in particular instances. In analysing the measurements presented for total wood growth for two comparable varieties, HOBLYN pointed out that "'Rivers' Early Prolific," the weaker-growing variety, received a greater stimulus by being worked on Myrobalan B, than does the more vigorous variety 'President'; on the other hand, while 'President'

is rendered more vigorous by 'Persnore,' 'Rivers' Early Prolific' is clearly dwarfed by this rootstock" [35]. Of course the question of particular stock and scion incompatibilities also looms large in the case of Plums.

EXTERNAL CONDITIONS AS MODIFYING AGENTS.

(a) Soil Type.

In 1926 the records taken on 'Lane's Prince Albert' trees on an attenuated series of rootstocks, but planted on four other soils—at Swanley Horticultural College (Thanet Beds); at the R.H.S. Gardens, Wisley (Bagshot Sand); at Mr. A. J. Carter's Farm, Newpounds, Wisboro' Green, West Sussex (Clay); and at The Tunstall Farm Institute, Kent (Clay with Flints)—were presented, and it was then possible to claim that "in each case the relative order of vigour and precocity has been the same as on the central plot at East Malling" [27]. Again, "it will be seen that although the size of tree on any given stock is markedly different on different soils, yet on every soil the dwarfing stock (Group a) 'Jaune de Metz' (No. IX) gives smaller trees of 'Lane's Prince Albert' than any other group of stocks on the same soil," and so on with the intermediate and vigorous groups. It has been possible to carry on some observation work upon the first four of these plots up to the present, and also to review the figures for the trees of 'Bramley's Seedling' and 'Worcester Pearmain,' which were planted in addition to the 'Lane's Prince Albert,' at Swanley and Wisboro' Green. Whilst the position reported on 'Lane's Prince Albert' in 1925, as shown in Table VIII, is still very generally confirmed by the measurements of stem girth, and height and spread of branches,

TABLE VIII.

Relative position of 'Lane's Prince Albert' on various rootstocks, five years old, on different soils, as shown by wood growth.

East Malling Order.	Wisboro' Green Order.	Swanley Order.	Wisley Order.
IX a		IX a	III
III	III	VII	IX a
II b	II b	III	VI
V	V	V	V
VI			II b
I c	VII	X	I c
X	OF 5* d	VI	VII
VII	X	II b	IV
XIII	I c	XIII*	X
XV		XVI d	OF 5 d
IV	IV	XV*	
XVI d		I c	
OF 5			

* In these cases only second-grade trees remained available for planting, so they are not strictly comparable with the rest; yet their slow-fruiting performance has been identical on all soils.



FIG. 68.—'BRAMLEY'S SEEDLING' AT TEN YEARS OLD
ON LAYERED FREE STOCK (XII).

(Cf. fig. 67.)



FIG. 69.—TREE OF *MALUS BACCATA* COMING INTO LEAF WHILST 'SUCKERS DIRECT FROM ROOTSTOCK ARE STILL DORMANT (RIGHT OF PICTURE).
(The influence of rootstock is thus not always direct.)

to date, for trees worked on type rootstocks of the main groups, even the peculiar and unexpected idiosyncrasies of trees on stocks such as Nos. III, IV, and VII are repeated.

Whilst the figures for wood growth given in Table VII emphasize the uniformity of behaviour on different soils of 'Lane's Prince Albert' on different rootstocks, other observations demonstrated that the apparent dislike of this variety for No. III, the vigorous growth and comparatively early cropping of trees on No. IV, the propensity to leaf scorch and the meagre cropping of those on No. V, and the characteristic relationship between height and spread and between vigour and cropping on No. VII, are all retained. Even where the trees in Group *d*, which in two cases were initially poorer one-year-olds, fail to have made more than vigorous growth up to date, their slow-cropping character in comparison with trees worked, say, on No. I, reaffirms their essential conformity to group type.

The measurements of stem girth, and height and spread of branches, for 'Bramley's Seedling' and 'Worcester Pearmain,' taken up to the time of writing, although the number of trees involved does not warrant a detailed discussion of the figures, are again of a confirmatory nature.

Table IX shows the relative order of vigour in these plots as expressed by girth.

TABLE IX.

Relative position to date of two varieties on various rootstocks on different soils, shown by girth measurement.

East Malling Order.		Wisboro' Order.	Swanley Order.	Tunstall Order.
<i>Manured.</i>	<i>Unmanured.</i>			
(a) 'BRAMLEY'S SEEDLING.'				
IX <i>a</i>		IX <i>a</i>		
I <i>c</i>	II <i>b</i>	II <i>b</i>	II <i>b</i>	II <i>b</i>
II <i>b</i>	I <i>c</i>	I <i>c</i>	I <i>c</i>	I <i>c</i>
XVI <i>d</i>	.			
XII <i>d</i>		OF 5 <i>d</i>		
(b) 'WORCESTER PEARMAN.'				
IX <i>a</i>			IX <i>a</i>	
X	X		X	
I <i>c</i>	II <i>b</i>	II <i>b</i>	II <i>b</i>	
II <i>b</i>	I <i>c</i>	I <i>c</i>	I <i>c</i>	
XVI <i>d</i>				
XII <i>d</i>		OF 5 <i>d</i>		

There is, of course, no question, either with regard to growth, cropping, or general characteristics, of the differences between the behaviour of trees on Groups *a* and *d*, and for that matter between either, and those on the intermediate Groups *b* and *c*. On the other hand, the fluctuating relationships betwixt these intermediate groups, in so far as vigour is concerned, point to a logical explanation for the

somewhat unexpected responses already referred to, of trees of particular varieties on No. I (Group *c*) and No. II (Group *b*). Whilst special congenialities of scion and rootstock are undoubtedly responsible for this in some part, soil factors *per se* may also contribute to the phenomenon. Although the evidence for this is not yet apparent, there are data available to show that cultural conditions, such as manuring, may definitely alter the relationship of these intermediate groups.

(*b*) *Cultural modifications—Manuring.*—At the outset, in discussing the relationship between trees on Group *b*, represented by No. II, and Group *c*, represented by No. I, the whole question of leaf scorch, which involves nutrition factors, must be borne in mind. As far back as 1925 an account was given of a study of the relative susceptibility to this trouble of different varieties upon different rootstocks [36]. It was then shown that representatives of Group *b*, such as Nos. II, V, and VII, were all much more liable, under suitable external conditions, to develop leaf-scorch symptoms than the representatives of Group *c*, such as Nos. I and VI. It was further demonstrated that certain scions worked on these rootstocks developed leaf scorch much worse than others, in particular 'Bramley's Seedling' shows the symptoms much more markedly than does 'Worcester Pearmain.' As a result of Wallace's work [69] in connecting leaf scorch with potash deficiency and a wrong "balance" in nutrition, an attempt was made on certain field plots at East Malling to ameliorate the trouble by a better balanced manuring, which involved the addition of considerable dressings of potash.

Two adjacent plots, on soil which is apparently very similar, comprising trees of 'Bramley's Seedling' and 'Worcester Pearmain' upon rootstocks representing both these groups, have been quite differently treated manurially ever since planting in 1919-20. Whilst the one has received a "balanced ration" from the first, the other has been completely starved, and, as a consequence, leaf scorch has become prevalent on the latter and has always been negligible on the former.

Now it is possible to compare the vigour, to say nothing of the cropping, of these two varieties, 'Bramley's Seedling' (susceptible to leaf scorch) and 'Worcester Pearmain' (resistant), on the two rootstocks, No. II susceptible and No. I resistant, grown under identical soil, cultural, and climatic conditions, but with two manurial "treatments," e.g. "starvation" and "complete balance." Under ideal manurial conditions 'Bramley's Seedling' on No. II produces a tree as vigorous as on No. I, but where conditions are less favourable to growth, the trees on No. II fall definitely behind those on No. I. This is well shown by the following measurements, upon trees which disclosed no significant difference at the outset.

At the end of 1928 on the manured plot, 'Bramley's Seedling' on No. II had a mean girth of 417 mm. against a mean of 410 mm. for trees on No. I. Both were considerably dwarfed under starved conditions, but while on No. I the mean girth was reduced to 369 mm., on No. II it was only 357 mm.

'Worcester Pearmain' is more striking still. Starved conditions had had no effect on the trees on No. I up to the end of 1928, their average girths being 281 and 283 mm. respectively for the manured and unmanured plots. The trees on No. II which averaged 310 mm. on the manured plot were significantly larger than those on No. I, whereas on the starved plot, similar trees only achieved a mean of 279 mm. and were significantly smaller than those on the manured plot.

Returning to an examination of Table IX, which compares the relative order of vigour on the East Malling plots with the trials on the other soils, it will be seen that, where no special precautions were taken to provide trees on No. II with a "balanced ration," in every case it produced less vigorous trees than No. I. In other words, even where particular scion partialities favour growth on No. II, unless special nutrient constituents are within its reach, it would appear that, as in the case of 'Lane's Prince Albert,' No. II is really a semi-dwarfing rootstock, whereas No. I maintains its vigour under a far wider range of scions and cultural conditions.

However, whilst cultural or nutritional factors may to this extent modify stock influence, a close examination of some of the other records from our starved and "complete manure" plots reveals the fact that apparently a really bad rootstock cannot be turned into a good one, however persistent are the ameliorating treatments. For instance, the unthrifty behaviour of 'Bramley's Seedling' on No. X stock has been in no way masked by nine consistent balanced manurial dressings. Again, the poor cropping capabilities of 'Worcester Pearmain' on No. V stock and the small size of the fruits show no significant improvement. Whilst the crop-weight of 'Worcester Pearmain' on a good stock such as No. I is 81 on the manured plot and only 57 on the starved, on the bad stock No. V it is 54 and 50 respectively. It is therefore unwise to imagine that in all cases bad trees consisting of unsuitable stock-scion combinations can subsequently be brought up to standard by any cultural or manurial treatments.

(c) *Subsoil Conditions.*—When in 1927 the successional plantings of 'Lane's Prince Albert' were compared, it was pointed out that, although trees on the different groups of stocks were relatively in the same order of vigour, the older plot had made much better growth at the same age than the trees in the second planting. It was suggested that either some seasonal, planting, or soil conditions were probably responsible. In particular, the trees on No. IX on the older plot had made double the growth of those on the younger at the same age—103 metres as against 47. Excavation work during the past two years has at any rate provided an explanation of the exceptional behaviour of these trees, and has further demonstrated that the modifications of rootstock influence brought about by external causes are in their nature subsidiary. When the root systems of these large trees on No. IX stock were excavated by ROGERS and VYVYAN, it was found that they were growing in an exceptionally deep pocket of soil which had

enabled the roots in some instances to penetrate to a depth of 9 feet [54]. Later, when the root systems of such strong rootstocks as Nos. I and XVI were excavated, it was found that the trees were growing on much less favourable sites, in some cases the solid rock coming within 3 feet of the surface. However, despite these discrepancies in subsoil conditions, the trees on Nos. IX, I, and XVI had behaved like typical trees on those stocks, both in vigour of growth and cropping capacity. The most that could be said of the effect of the good pocket of soil was that the trees growing thereon were exceptionally good trees on No. IX, and that if those on No. XVI had chanced to be in that location they would probably have been even more vigorous than they actually were, and possibly even slower in cropping.

It seems only likely that other external conditions such as climate and rainfall may in a similar manner modify or accentuate the normal potentialities of any particular combination of stock and scion, though such evidence as is already available would once again suggest that such changes would be of a minor character. For instance, the account sent back to East Malling of the relative behaviour of Apple rootstocks sent out to the Allen Orchard Company, Ramgarh, Kumaon, U.P., India, falls closely into line with the characteristics of identical stocks at home. Again, first accounts from Ontario with regard to the early-growth performance of Peach trees budded upon different varieties of Plum stock, hint at a story akin to that on identical material at East Malling. These facts do not mean that external conditions may not profoundly affect the *actual* performance, and hence utility, of any individual rootstock in growth, cropping, depth of rooting, etc. However, they do reinforce the conclusion that, given the same range of comparison, any one rootstock will retain essentially its relative place in the order to which it belongs. So far, although the data presented and the conclusions drawn in this paper have mainly been based on readily measurable characters such as wood growth, girth, height and spread, number of blossom buds and fruits [31], the fact that there are other manifestations of stock influence, less easily measurable, yet just as important, has been stressed. Observations over a considerable number of seasons are necessary before the constancy of some of these characteristics can be proved, but a mass of data, as yet unpublished, goes to reinforce the early indications.

Since the nature of the growth, shape of the tree, propensity for axillary and terminal fruit-bud formation and percentage of blossom setting, associated with particular rootstocks, are all capable of some numerical comparison, it is only necessary to refer to the details already given elsewhere for 'Lane's Prince Albert' [31] and to say that similar consistent phenomena attributable to stock influence have appeared on the other varieties tested. The relative time of blossoming of different varieties on the same series of rootstocks has again fallen into line with the data presented for 'Lane's Prince Albert' [37]. All these several rootstock influences upon shape of tree, type of fruit-bud formation, and relative time of blossoming are equally

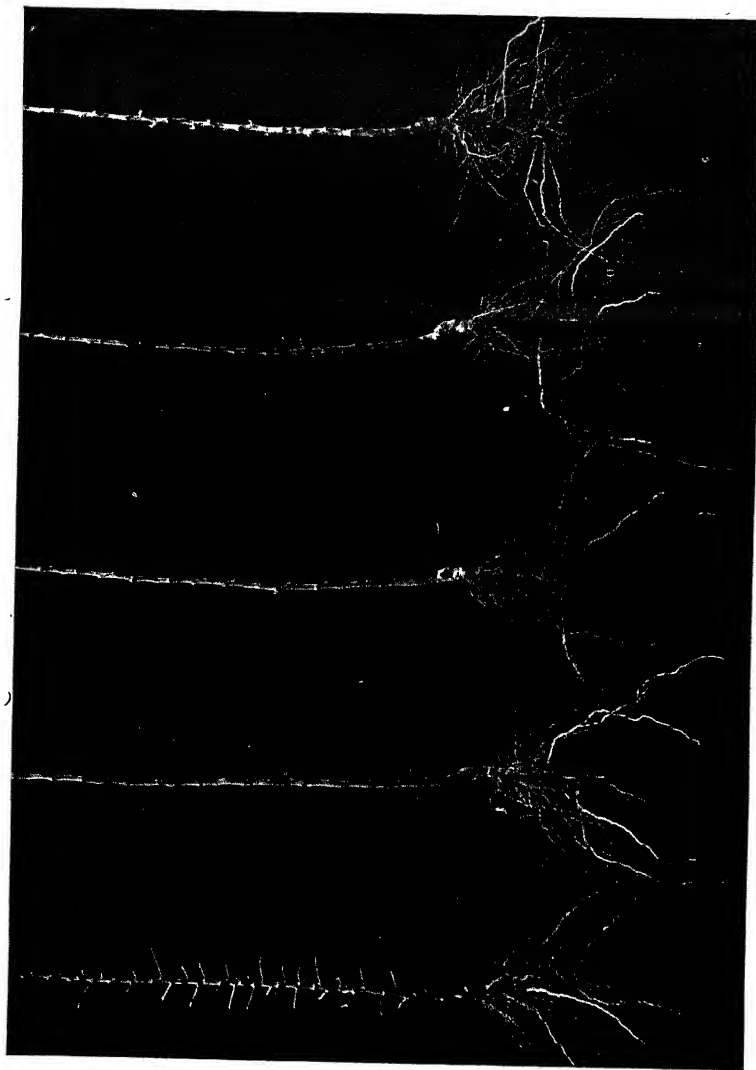


FIG. 70.—UNWORKED 'NONSUCH' (VI) PARADISE, AND TREES WORKED UPON IT.
(Note similarity of root type—much fibre from entire stock stem.)

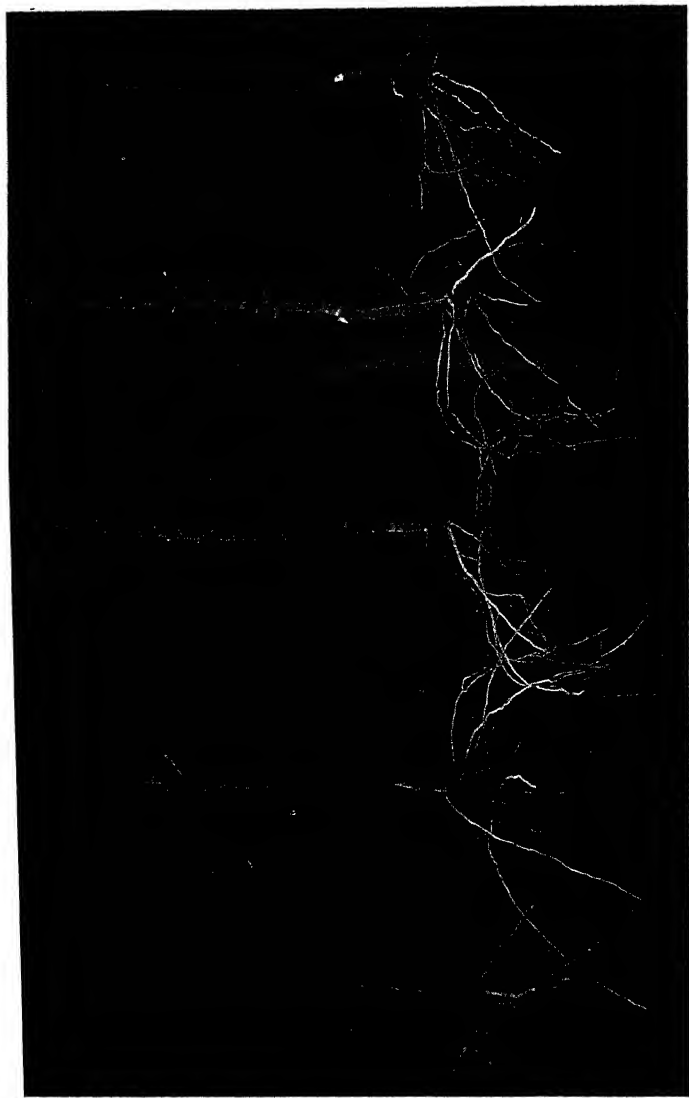


FIG. 71.—UNWORKED 'DOUCIN (II) PARADISE' AND TREES WORKED UPON IT.
(In all coarse roots originate mainly from base of stock, with little fibre. Scions budded on stock stems affect root characters only to a minor degree.)

[To face p. 201.

obvious in Plums [35]. Again, a fairly constant factor throughout these experiments has been the relative roothold of particular rootstocks, which appears to be entirely independent of depth of rooting and even of kind of scion, except that, as would be expected, the heavier headed varieties are more easily caught by the wind.

The habit of particular rootstocks to send up sucker growths is certainly largely varietal, but, especially in Plums, there is some evidence that the reciprocal effect of scion variety also counts [35].

Enough data have already been published on the effect of rootstock upon the size, colour, and quality of the fruit [25, 53], in Apples, to prove it to be a factor both of scientific and practical importance. Further data have been accumulated as the trees on different stocks mature, and it has become evident that, even when a single variety is worked on such closely allied stocks as Nos. II, V, and VII, the quality of its fruit differs widely. In Plums, apart from a quantitative effect, the evidence is as yet incomplete [35].

Both Plums and Apples show an apparent early maturity—at least, so far as colour is concerned—upon particular stocks.

The pathological aspect of the rootstock question can conveniently be divided into two aspects—the immunity of the rootstocks themselves to certain diseases, pests, and physiological disturbances, and the effect of these rootstocks upon the scion. Certain varieties of apple stocks, in the nursery, are undoubtedly more susceptible to such diseases as Crown Gall [72], Apple Canker, Scab, and Mildew [25], as they also are to the Green Apple Aphis [50] and the Woolly Aphis [63, 47]. The same might be said of Red Spider on Plum Stocks. It has already been stated that in the physiological trouble known as “Leaf Scorch,” susceptible rootstocks transmit their susceptibility to the scion, but no such complete correlation can yet be consistently claimed in the above-mentioned diseases and pests, though in the case of Crown Gall, WORMALD’s and GRUBB’s results suggested a possible effect of the scion upon the resistance of the roots [72]. On the other hand, records show quite definitely that certain alliances of scion and stock are more prone to Scab [11] and Mildew in the field than other combinations involving the same scion variety. Again, data of this sort need to be collected over a number and variety of seasons before the general behaviour can be determined; nevertheless the evidence is now very strongly in favour of the rootstock disturbing the pathological susceptibilities of the scion. The explanation is at present lacking, unless it is to be found in the seasonal growth rates and time of bud break of any particular scion on a series of rootstocks, upon which point SWARBRICK has presented some valuable data [66].

The Causes of Stock Influence on the Scion.

Whilst evidence has thus been accumulated, not only in deciduous but also in Citrus fruits, to prove the potency of rootstock influence, the theoretical side of the question has not been entirely neglected.

It is possible to assert, as a result of empirical field trials, that something other than the purely quantitative features of the rootstock is at work. For instance, whilst it not infrequently happens that a dwarf or vigorous growing stock affects the scion in the direction indicated by its own habit, there are now so many established cases to the contrary that this explanation cannot be accepted as a general principle. ✓ The same may be said for the propensities of any rootstock to early fruit production. Whilst No. IX Apple stock fruits readily on its own roots and transmits this characteristic to a wide range of scions, No. VII, which is notable for producing heavy crops when worked, has never borne a crop of fruit on its own roots. The Common Plum stock provides a similar instance in Plums. Again, as has been pointed out elsewhere, many of the obvious but less measurable stock effects cannot be correlated with the stock's own behaviour. The fact that the Myrobalan (*Prunus cerasifera*) Plum stock, which comes into blossom and leaf long before any of our cultivated varieties of Domestic Plums, delays the time of blossoming and leaf development, whilst the late-blossoming 'Perschore,' when used as a rootstock, accelerates it, affords a good illustration. Year after year at the Research Station an interesting phenomenon has been seen: a tree of *Malus baccata* in full leaf and blossom, whilst the suckers from the "crab" on which it was worked were still completely dormant (fig. 69).

Since rootstock influence did not seem capable of any such simple quantitative explanation, it has been necessary to turn to the physiologists and bio-chemists in the hope of finding out whether along the lines of their pure sciences it is possible to present a classification of rootstocks running parallel with marked discriminations shown in the field. By these means it is thought to piece together the picture of the interactions of one part of the tree with another, and so obtain an intimate knowledge of its functioning. This alone can open the way to establishing complete control, and ultimately afford a sure standard by which to select and predict the performance of given combinations under known sets of circumstances.

✓ Whilst engaged in these studies, KNIGHT has made an attempt by means of field experiments to carry out a preliminary analysis of the problem of stock influences [42]. Starting with the knowledge that "the morphological expression of the influence of stock upon scion includes both quantitative and qualitative phenomena," he suggested that "it is reasonable to suppose that a quantitative difference such as that of vigour, may be due to a difference in the quantity of some nutrient substance supplied by the root system to the scion. On the other hand it is conceivable that rootstocks may differ in their action as a result of qualitative differences in their protoplasm, which might involve, for example, qualitative differences in absorption from the soil, or metabolic differences."

On this foundation, an experiment was designed to try to determine "to what extent differences in scion performance are due to quantitative and to qualitative stock differences respectively."

"A series of trees was prepared in which the stock, instead of being budded normally, was budded with three separate buds of the scion, placed as near the same level as possible," the idea being to compare the growth and fruit-bud formation of these multiple-budded trees with single-budded ones on similar rootstocks. In the one the supply of nutrients from the roots would have to be distributed amongst several separate scions instead of to a single one, and these by their behaviour, at least in the early years, would show whether this change of quantitative relations produced results comparable to those effected by a change of stock. The experiment was twice repeated on different rootstocks. All the trees bearing twice as many scions as the normal single-budded ones produced a greater total length of growth *a tree*, but the *individual* scions of the multiple-budded series produced less vegetative growth than normal-budded trees. ✓ In the case of blossom-bud formation some of the scions of the multiple-budded trees bloomed a year earlier than the normal trees, but in subsequent years the latter took the lead, though the marked differences in vegetative growth did not decrease. To quote once again from KNIGHT's summary: "A single experiment extending over such a short period (three years) does not justify the far-reaching conclusions that, in stock: scion relations, whilst quantitative stock factors influence vegetative growth, reproductive growth is governed by qualitative considerations. There is indication, however, that although some effect has been produced on vigour by the quantitative change in the form of the tree, this agency has not produced any change in *reproductive* growth which is at all comparable to that which can be produced by a change of stock." ✓

A further ingeniously designed "double stock" experiment, where scions drawing nutriment partly from a vigour-inducing rootstock and partly from a dwarfing one were compared with the same variety supplied by two rootstocks of the same order, showed clearly that rootstock characters can be blended in an even manner. Whilst the trees drawing their supplies from two No. I roots made 705 cm. of new stem, those on Nos. I and IX combined made only 584 cm., those on Nos. II and IX made 496 cm., and those on a double No. IX root system made 390 cm. The numbers of blossom buds produced were respectively 8.8, 10.4, 25.4, 53.6. Thus, whilst there is no indication of any considerable dominance of the invigorating influence of one stock over the dwarfing capacity of the other, it seems possible that the late-fruiting tendency of No. I to some extent dominated the precocity of No. IX.

To sum up, "since the factors influencing vigour can be thus combined by vegetative means, it appears likely that they are physiologically of a quantitative nature, but judgment concerning blossom-bud formation must be suspended" [42].

Probably because the practical issue has been overmuch in the minds of workers on rootstock problems in this country, it has been customary to talk about rootstock influence somewhat loosely, on the

assumption that all who were accustomed to the universal European practice of stem working would understand "rootstock" to include a portion of the stock stem as well as the root system. However, the very timely challenge of SWARBRICK and ROBERTS [67], who questioned whether the influence resided in the root or the stem alone, or in a combination of both, has considerably clarified the discussion upon the theoretical aspect.

The solution of this question has been sought from two rather different aspects, neither of which up to the present has supplied a completely convincing answer. Neither the study of the influence of an intermediate scion, placed betwixt a known rootstock and a second scion, nor that of the reciprocal effect of the scion on root character has yet yielded decisive evidence sufficient to exclude the influence of stem as distinct from roots or vice versa.

In 1923 GRUBB reported that he had then some 350 "double worked" trees, from two to five years old, under observation, and he added "whilst combinations of varieties of extreme differences have been used, results, though definite, are not yet striking." "Of Pears also, some 300 trees, now from one to four years old, have been planted. Striking differences between varieties in their value as intermediates have already been found, and seem to bear no relation to their vigour" [15]. It is hardly necessary to state that all these trees were stem worked upon uniform clonal stocks. Though from time to time notes have appeared with regard to the progress of these experiments, in Apples, no data have been published precisely because the statement he made so early needed little revision. Because the results, though definite, were not on the whole striking, it was thought desirable to let the evidence accumulate. One very interesting piece of evidence has, however, come out of these experiments—namely, that in certain cases it seems that the longer the piece of intermediate scion the more definite has been its influence. Whilst 3 inches of "intermediate" have produced an effect, 2 feet of the same have intensified it. This is well shown in diagram form (fig. 72). The writer is indebted to GRUBB for data on this which are as yet unpublished.

It will be noted that the curves for the trees with the long intermediates are wider apart than those for the trees with the short intermediates, thus indicating the greater influence of the longer intermediates.

In a preliminary report on double worked Pears [16], he showed that "the variety used as intermediate in double working has a distinct influence on the vigour of the second scion" and that it "probably has an influence on the age at which the tree begins to bear fruit."

These influences of the intermediate cannot always be directly correlated with the vigour of that intermediate, either in Apples or Pears. Indeed there are striking exceptions.

KNIGHT, by using Apple rootstock varieties, in a series of double worked trees, designed to elucidate the part played by the root and by the stem of the stock, was able to show that both vigour of growth

and fruiting capacity were considerably influenced by the nature of the intermediate piece of stem, the length of which was about 6 inches [42]. For reasons then explained he refrained from grafting directly upon the stock roots although the trees were worked as close to the root as possible, but this fact prevents him from differentiating completely between root and stem influence, though the results "indicate that whilst the root system of the stock is probably the dominating factor in the influence

of stock upon scion, yet at the same time the stem of the stock also plays a part which may be considerable."

ROBERTS, presumably drawing evidence from two lines of investigation on young nursery trees, asserts that "obviously stock influence is due to the stem portion of the stock" [52a]. First he shows an illustration of two-year-old trees, where stem pieces of Malling No. XII (very vigorous) and No. IX (very dwarfing) have been placed directly upon the roots of French seedlings, and then top grafted with

'Whitney' and 'Wealthy.' The illustration certainly shows "the influence of the intermediate stem piece upon the amount and type of growth." In other words, he has obtained proof of the influence of intermediate stems directly grafted on to seedling roots.

In an earlier paper SWARBRICK and ROBERTS [67] suggested that

- (1) "Scion varieties determine root character when grafts are placed upon seedling roots;
- (2) Scion varieties do not much affect root character when placed upon vegetatively propagated rootstocks,"

the latter being stem worked.

In fact, in all instances where a scion is placed in direct contact with the root, the root system will conform to the root character of that scion. Thus, whenever a tree is high-budded or when the necessary portion of stem is replaced as in double working as there practised, the root system will take on the character of that piece of stem. From

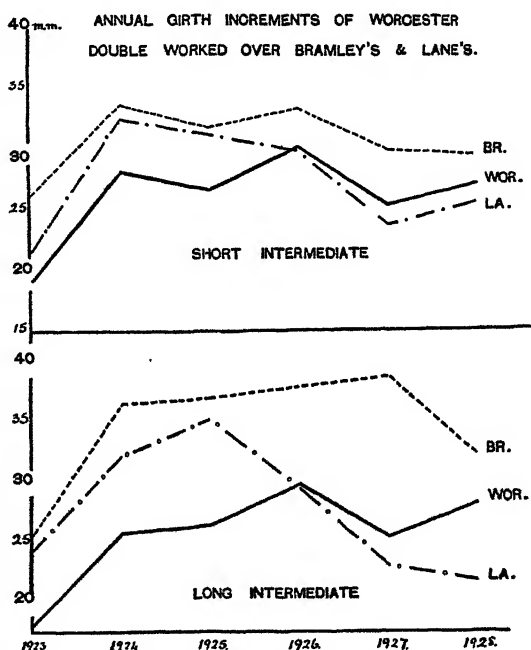


FIG. 72.—THE EFFECT OF SHORT AND LONG INTERMEDIATES IN DOUBLE GRAFTING.

this it is argued that the true seat of stock influence is probably to be found in that piece of stem. However, until the later performance of such bench-grafted trees is recorded, there remains the possibility that ultimately these seedling roots apparently made uniform by scion influence may, in actual fact, behave differently. For, as these authors affirm, "it cannot be argued that a rootstock has lost its influence over the top merely because its growth character has been altered as a result of scion influence." To take but one instance, with the vegetatively raised rootstocks Nos. II, VII, and Long Ashton OF 5, though all appear to be very similar in their root characteristics, enough data have already been presented to show how differently scions stem-worked thereon respond.

A very interesting piece of circumstantial evidence, bearing on the influence of the intermediate stem, is to be found in some of the best nurseries on the Continent of Europe. Here the writer has seen amazingly uniform flats of standard Apple and Pear trees growing upon seedling roots but with certain selected intermediate varieties, known as "stem builders," such as 'Noire de Vitry' and 'Gelber Trieres Weinapfel,' which formed the whole length of stem some 5 to 6 feet in length upon the top of which was budded the ultimate scion. Although these "stem builders" are budded on to the stems of the seedling stocks, it is quite arguable that their influence, enhanced by the exceptional length, is much greater than that of the small portion of stock stem, and accounts for a far greater measure of uniformity than is usually found on similar flats of low-budded trees.

It would seem, then, that for the present the discussion must be left where it is, time alone being able to show whether varieties root-grafted upon clonal piece roots will respond in the same way to rootstock as they do when stem-grafted upon members of the same clone.

Such a series of trees two years old is now in existence at East Malling, and every care is being taken to avoid scion rooting. However, until at least another season has gone by, it would be rash to draw any deductions, either from their vigour of growth or early fruit-bud formation.

Reciprocal Effect of Scion on Rootstock.

The foregoing discussion has set forth the point of view of ROBERTS and SWARBRICK on this matter, and the conclusions they have drawn in distinguishing stem-worked from root-grafted trees; in the former scion influence on root is only of a minor character, whereas in the latter it is all-powerful.

SWARBRICK [64] has connected up this latter phenomenon with work published by himself [65] and KNIGHT [43] as to the downward progression of annual growth increment, and even hints that this may be the operating cause of stem influence upon the root, since the latter is so dependent on the former for its nutrition.

In view of THOMAS ANDREW KNIGHT's dictum that "the office of the stock is, in every sense of the word, subservient, and it acts only

in obedience to the impulse it received from the branches" [5], and of PICKERING's passing reference to scion effect upon Paradise stocks [5], very careful observations were kept at East Malling whenever stem-grafted young trees were lifted from the nursery, and as early as 1920 [23] the quantitative effect of a scion such as 'Bramley's Seedling' was recorded. In 1923 a preliminary detailed analysis of the root systems of one-year trees of a series of varieties on Malling Nos. II and VI and other rootstocks was described, and the general conclusion reached that the different scions did in a minor degree modify the character of any clonal root system, but not sufficiently to obliterate its own very distinctive characteristics (figs. 70, 71).

In order to see whether this was more or less accentuated with the age of the tree, a further series was prepared and analysed in February 1927, and although the full details of the results are as yet unpublished they confirm the undoubted facts that there is a measurable difference in such a character as percentage of fibre between two contrasted stocks such as Nos. II and VI, whether they are unworked or budded with a series of very distinct scion varieties.

In the two-year series the differences between the two rootstocks are still strikingly maintained, but they are no more obliterated by scion influence in the second year than they were in the first. The following table well illustrates the state of affairs.

TABLE X.

Analysis of the root systems of two-year-old trees of four varieties on two rootstocks.

	On No. VI.		On No. II.	
	Total root weight.	Per cent. fibre.	Total root weight.	Per cent. fibre.
	Grm.		Grm.	
Unworked . . .	42	51	60	19
'Lord Derby' . .	42	54	53	28
'Beauty of Bath' .	47	43	54	24
'Grenadier' . . .	63	38	62	22
'Newton Wonder' .	42	68	54	24

Apparently ROBERTS attempted to show scion influence in 1927 on a layered stock, Malling No. I, which was worked with four varieties, other stocks unworked being left for comparison. Unfortunately he presents no analytical data, but merely illustrates his point by a picture. The differences there shown, although they are not definitive, would appear to anyone conversant with this root type to show quantitative rather than qualitative differences similar to those illustrated above.

At the time of writing a similar series of two-year-old piece root-grafted trees is being subjected to analysis, and the general appearance of the roots suggests that two such distinctive rootstocks as Nos. II

and VI, even when piece root-grafted, retain a considerable measure of their individuality.

These apparently isolated and somewhat contradictory data are, however, in fact providing the bricks wherewith our knowledge of the whole structure of the interrelationships of one part of the tree with another will be pieced together. Meanwhile, from the practical point of view the proven importance of rootstock influence upon the scion remains. Whether it is possible to obliterate it by bench-grafting, overshadow it by double working, or to eliminate it altogether by growing trees on their own roots, the part played by the root must be taken into account. In Europe, where the use of permanent and "filler" trees has become of recognized value, cultural practice will doubtless be maintained along the traditional lines of utilizing rootstock influence to the full, and of developing it yet further by a closer study of the most suitable combination of scion and rootstock—so as to establish a standard of performance and measure of control as yet so imperfectly attained.

ACKNOWLEDGMENTS.

In attempting to review so wide a field of work, and to combine with it many of the experimental results at East Malling, it is difficult to know where to begin in the matter of acknowledgments. The writer has tried faithfully to summarize the findings of other workers upon rootstock problems and has found the data most valuable. He can only crave their indulgence if he has anywhere misconstrued them inadvertently.

The scale and co-operative nature of the experiments at East Malling make it impossible to refer individually to the whole line of assistants whose careful work alone has made the presentation of the data possible, but the names of Mr. J. AMOS and Mr. A. W. WITT must always be associated with these investigations.

The writer owes a particular debt of gratitude to Mr. T. N. HOBLYN, who, with the careful assistance of Miss A. D. MACKENZIE, has not only assembled a mass of numerical data, but has also evaluated it and contributed generally his unstinted aid in the production of the paper.

The Imperial Bureau of Fruit Production has helped the writer both in tracing many of his references and by bringing to his notice additional ones. Finally, thanks are due for the many suggestions made by Dr. R. C. KNIGHT and Mr. N. H. GRUBB in reading through the manuscript and proofs.

SUMMARY.

The behaviour of fruit trees on their own roots and the practice of working them in preference upon rootstocks are discussed.

The method of grafting on to the stock stem is contrasted with whole and piece root grafting. Scion rooting is often intentionally encouraged in the latter. Instances of variability of trees on seedling

rootstocks and other causes of variability are cited. Trees on clonal layered stocks are compared. The possibilities of eliminating incompatibilities thereby are suggested. Attempts to obtain true lines from seed are quoted. A wider use of vegetatively propagated rootstocks is suggested. Causes of variability within the clone are discussed.

✓ Evidence in favour of scion selection and bud variation is considered.

✓ Experiments proving effect of rootstock upon scion are summarized. Numerical data are given illustrating special scion potentialities, stock peculiarities, modifications due to soil and subsoil type, and cultural treatments, such as manuring.

✓ The less measurable but marked characteristics conveyed by rootstock to scion are emphasized, and shown to increase with age of trees.

Attempts to elucidate the cause of stock influence are reviewed. The effect of an intermediate scion is discussed in relation thereto. This appears to increase with the length of the intermediate.

✓ The reciprocal effect of the scion upon the rootstock is considered and figures presented showing the minor modifications caused by the use of different scions worked upon the stems of layered rootstocks.

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ENGLISH GARDEN MAKING UNDER THE EARLY STUARTS.

By H. AVRAY TIPPING.

[Read March 25, 1930; Mr. M. FENWICK in the Chair.]

WHEN I last had the pleasure of addressing this Society I rapidly reviewed five centuries of English gardening. To-day I propose dealing, in some detail, with the earlier half of the seventeenth century.

I choose the reign of the first two Stuarts for various reasons. In the first place the peaceful accession of JAMES I in 1603 allayed much of the dynastic and religious anxieties that occupied men's minds under ELIZABETH. The country was quiet, the leading personages were wealthy, and so splendid housing was to the fore. Audley End and Hatfield were built. Knole and Bramshill were reconditioned and developed. Their environment called for as much care as their edification. By this date also we have a garden literature. THOMAS HILL had extended the "Briefe and Pleasaunt Treatyse" which he printed in 1563 into the "Gardener's Labyrinth," of which there was more than one edition published before JAMES's accession. JOHN GERARDE brought out his "Herbal" in 1597. An English edition of CRISPIN DE PASSE's "Hortus Floridus" appeared in 1616, by which time BACON was considering his "Essay on Gardens," WILLIAM LAWSON had his "New Orchard" nearly ready for the printer, and JOHN PARKINSON was growing the plants and making the notes that formed his "Paradisus" published in 1629.

But what really enables us to realize clearly how a great man's garden was conceived, laid out and planted in the days of JAMES I is the detailed information which we derive from the surviving accounts of Lord SALISBURY's works at Hatfield and at Cranborne, which were more or less complete when he died in 1612.

ROBERT CECIL, created Earl of SALISBURY in 1605, was the clever younger son of Lord Treasurer BURGHLEY, and himself became Lord Treasurer to JAMES I after having previously served him and ELIZABETH as Secretary of State. He joined a deep knowledge of home affairs with a wide Continental outlook. In building and garden making, as in politics and diplomacy, he sought to be alive to the last move, the newest development.

To translate such a desire into practice in the domain of horticulture meant reliance on foreign examples.

Those who travelled knew them in reality. Those who stayed at home knew from drawings and engravings what Frenchmen like DU CERCEAU had done in the building and environment of such châteaux as Anet and Gaillon. In 1583 VRIEDMAN DE VRIES had published at Antwerp his "Hortorum Vividariorumque," which included many

designs for most elaborate formal gardens. Like features are present both in what DU CERCEAU did and DE VRIES drew. Galleries, open or closed, bounded the garden on one or more sides. Terraces lay in front of the house and might surround sunk portions of the garden. The outer galleries would probably be of masonry or wood, but the garden would also contain galleries or herbaries of topiary work. Great fountains of elaborate device would occupy important points, and there would be squares of topiary work and of knots of flowers and of herbs.

It was on such publications as these that BACON had to rely for his conception of the "Royal Ordering of Gardens" embodied in his well-known essay, which describes a garden more princely than any which saw the light in Jacobean England. It was also to such books that SALISBURY and his garden experts had recourse when it came to so large and elaborate a lay-out as that at Hatfield. Neither the already published "Gardener's Labyrinth" nor the forthcoming "New Orchard" dealt with anything more ambitious than modest country gentlemen's gardens. Thus in the former we have pictured a small, hedge-enclosed rectangle, with a herber or arbour, a shelter for beehives, a central parterre with eight sets of beds, and gardeners at work, one pumping an early form of sprayer being prominent (fig. 73). LAWSON'S garden is ampler and has more features. It has four mounts topped by summer houses, one of its squares is disposed in knots for flowers, and there is a central fountain. All the rest, however, is utilitarian—kitchen garden, orchard, and standing for bees. It was on a much larger scale than this that SALISBURY worked, not only at Hatfield but also at the lesser Cranborne. There we still find much such a lay-out as we know, from JOHN SMITHSON'S drawings, was adopted for Wollaton in Nottinghamshire and Ham in Surrey. The sense of enclosure, which had been essential defensive in medieval times, was still dominant, for reasons of privacy and shelter, in Renaissance gardens, both Continental and English, as we have seen in the examples from DU CERCEAU and DE VRIES. The favourite Smithsonian plan was a scheme of a large rectangle divided into nine smaller ones, the central one being occupied by the house, two others form the forecourt in front and parterre behind, while sets of squares flank this middle group. That at Wollaton was drawn to show this scheme in geometric perfection, and dates from about 1615. But an oil picture of WILLIAM III's time gives a modification of this plan, due, no doubt, in part to later alterations, but in part also to the nature of the ground and of the approaches. SMITHSON'S "platform" of Ham, as the place was completed by Sir THOMAS VAVASOUR about 1610, shows the same idea, but with two instead of three hedged-in rectangles at either side of the central arrangement. The Wollaton formal gardens disappeared long ago. At Ham (figs. 74, 75) formality is still retained, but on the enlarged plan carried out by the LAUDERDALES under CHARLES II. At Cranborne (fig. 76), however, there has been very little change, as we may judge from the original plan of the lay-out which gives an area of 320 feet by 550 feet,

or about four acres. Here, as at Wollaton, the house occupies the central division. South of it is the enclosure called "the courte garden," while to the north is the "tarris," and below it is the enclosure called "the court." Of the three enclosures east of the house, the centre one is the kitchen garden, with "the woodd courte" to the north and the "privie garden" to the south. To the west the most important section is described as "wheare the mount is" (fig. 77). So little alteration has been made here that a bird's-eye view of house and gardens taken from the church tower shows the main lines and many of the particular features of this garden scheme which was begun in 1609 when MONTAGU JENNINGS, whom we shall shortly meet at Hatfield, was "sent thither by your Honours appointment to survey the garden plat there."

At Hatfield, although far-reaching changes have been made, we can still trace a not dissimilar arrangement, but on an ampler scale and with very important additions and extensions, all of which surviving documents enable us to realize. The house had been begun in 1607, and in that year MONTAGU JENNINGS was sent there "to take a plot of the park and other grounds for the enlarging of the same." To-day such a person would be dignified with the title of Landscape Architect. In the Hatfield papers he merely appeared as "Mountain Gennings, the gardener," his name being so written by ROBERT LYMINGE, who, although fulfilling the functions of a mere clerk of the works, was in reality the principal designer and draughtsman of the house, his superior, Sir THOMAS WILSON, merely having charge of the Hatfield works in his capacity of SALISBURY's principal and general man of business.

By August 1609 the building of the house (fig. 78) was sufficiently far forward for JENNINGS and LYMINGE to meet and settle on the making of the terraces which were to lie (and still do lie) on all sides of the house except that to the north, occupied by the forecourt. Meanwhile much had been done below the terraces. The plats or parterres lying below them to east and west were already, in great measure, laid out, and we find an account amounting to £19 7s. 10d. for work done there in July. Included are the charges for "making an end" of all the grass and knots, setting all the borders with pinks, mowing the grass walks, cutting the knots, new raking, treading and beating the walks, casting up of brickdust and bringing it in, watering the trees, dressing the pinks and weeding the walks and quarters. The garden to the west has remained little altered.

What the up-keep of the garden was to cost had already been inquired into. The east, west and kitchen gardens, which were complete, would need "3 workmen at 18d. a day, 2 labourers at 12d. a day and 6 women at 6d. a day." The working days of the year—Sundays and holidays being omitted—amount to 293 and the annual expense to £138 3s. 6d.

Meanwhile, trees of all sorts were arriving through gift or purchase. Sir MICHAEL HICKS writes to SALISBURY in October that Sir EDWARD

SULYARD's grapes "are as good as ever I tasted of for the relish and sweetness." He is prepared to present SALISBURY not merely with cuttings, but with half a dozen roots, also Plum and Nectarine trees, together with "anything else he hath in his garden or orchard." A letter of the same date to SALISBURY is from "Lady TRESAME," evidently the widow of Sir THOMAS TRESHAM of Rushton and Lyveden. She asks him to "accept of (a widow's mite) half a hundred of trees out of Lyveden orchard towards the planting of the orchard which I hear your Lordship intendeth at Hatfield."

From HENRICH MARCHFELD—no doubt a Dutch grower—came Walnut, Quince, Medlar and Cherry trees, while in 1610 there were planted 453 Cherry trees which came from Sir JOHN TUFTON, and 400 "Sicamor trees" arrived from "the lowe countreyes," which "lyming and Jennings say the best and carefulest brought that ever they sawe." The year 1611 was one of great garden activity. The terrace and parterre walls set with garden houses are completed. The "littell squar buildinges" which still stand at the east and west ends of "the South wall that incloseth the inner Court" are mentioned, and also pairs of such in both east and west gardens.

Meanwhile SALISBURY's decision to place his new house on high ground with prospect on every side—an unusual choice at that date—had created a problem not easy of solution. No self-respecting garden-maker in either medieval or Renaissance days would plan a fountainless lay-out, and to get fountains at Hatfield the best water engineer then in England was called in.

This was SALOMON DE CAUS, who, in 1609, was not only mathematical tutor to HENRY, Prince of Wales, but also contriver of water works at his palace at Richmond, as we know from DE CAUS's book "*Des Grotes et Fontaines pour l'Ornement des Maisons de Plaisance et Jardins*."

We first come across him at Hatfield in November 1611, when WILSON writes to SALISBURY of the Frenchman who went with him to Hatfield, where they took levels to make a reservoir or "new conserve d'eau," and also to contrive in the east garden four fountains at different levels, "each receiving their water from that next above it." To raise water to the desired level, DE CAUS, who is elsewhere in the Hatfield papers called "Sallamon decayous the prince's Inginer," devises at the river "a force at the going out of the water from the island which by the current of the water shall drive up water to the top of the bank above the dell, & so descend into two fountains." WILSON also tells the Earl that DE CAUS will make him models of the "force." One of these survives. It is a mere sketch showing the river passing through, but also arranged to encompass a square garden with banquetting hall across the main stream and fancy buildings at the corners of the island. The "force" is represented by a tower with a water-wheel at its side (fig. 79). It was in working order by November 1611, when we hear that "the water is lett in to the workes at the river which run verie pleasantlye."

The fountains were probably to be in the east garden, just below

the house, but the nearest point of the river Lea to the house is the best part of a mile away, and there is the surviving estimate of one SIMON STURTEVANT for providing and laying 1,793 yards of 2-in. "pypes of erth smitted." Whether this was to bring the water from the "force" or by gravitation from a spring is uncertain, apparently the latter, and the small supply thus available may account for a cutting down of DE CAUS's fountain scheme from four to one, for it is for one only that we have an account which is headed "Mon^r De Cuase his Reckonings for Chardge of makeinge the faountaine." He was paid £106 19s., but the basin of marble and the metal figure that stood in the centre were the work of "Garrett Jonson carver," who received £70, besides another £10 for his "payns for Casting the figure." The figure appears to have been one of Neptune, for BUCKITT, the painter, who did so much work indoors at Hatfield, makes a charge for "coulloringe the rocks in the greate sesterne in the East garden and coulloringe the picture of Neptune."

This fountain is gone—as indeed are most of Tudor and Early Stuart date. One, however, remains at Bolsover, which JOHN SMITHSON was enlarging and developing for Sir CHARLES CAVENDISH within SALISBURY's lifetime, but the fountain must date from some twenty years later. I have elsewhere described it: "A hedged octagonal enclosure has a pathway round it edged by the battlemented top of the wrought stone wall of a sunk area, of which the centre is occupied by the somewhat fantastically shaped and much rusticated base of a large tazza, richly carved on the outer side, and from the interior of which rises a plinth on which stands 'a statue of Venus, who has drapery in her hands, and one foot on a step as if ascending from a bath.' An earl's coronet, surmounting the Cavendish crest on the tazza, fixes the date as after 1628, and the design was probably made by HUNTINGDON SMITHSON, who will certainly have considered it 'Italian.' In fact both tazza and statue are likely to have been products of that country (fig. 80).

After HENRY, Prince of Wales, died in 1612 SALOMON DE CAUS went abroad and we hear of no more of his works in England. But his son or nephew ISAAC carried on, and indeed developed, fanciful water works for the Garden of Pleasure. The book he wrote on them—it was translated into English by JOHN LEAK in 1659, who described him as "a late famous Engenier"—is but an amplification of that by SALOMON. It is full of the strangest tricks and contrivances, one of his water-power triumphs being "Divers Birds which shall sing diversly when an Owl turns towards them: and when the said Owl turns back again they shall cease their singing." Much of this he introduced into the gardens which, in CHARLES I's reign, he laid out for the Earl of PEMBROKE AND MONTGOMERY in front of the splendid new south side of Wilton House, with which INIGO JONES and JOHN WEBB were then busy. The engraving of it, signed by ISAAC DE CAUS, shows us a great rectangle with broad walk down it, but arranged diagonally into three sections. The first is of knotted parterres

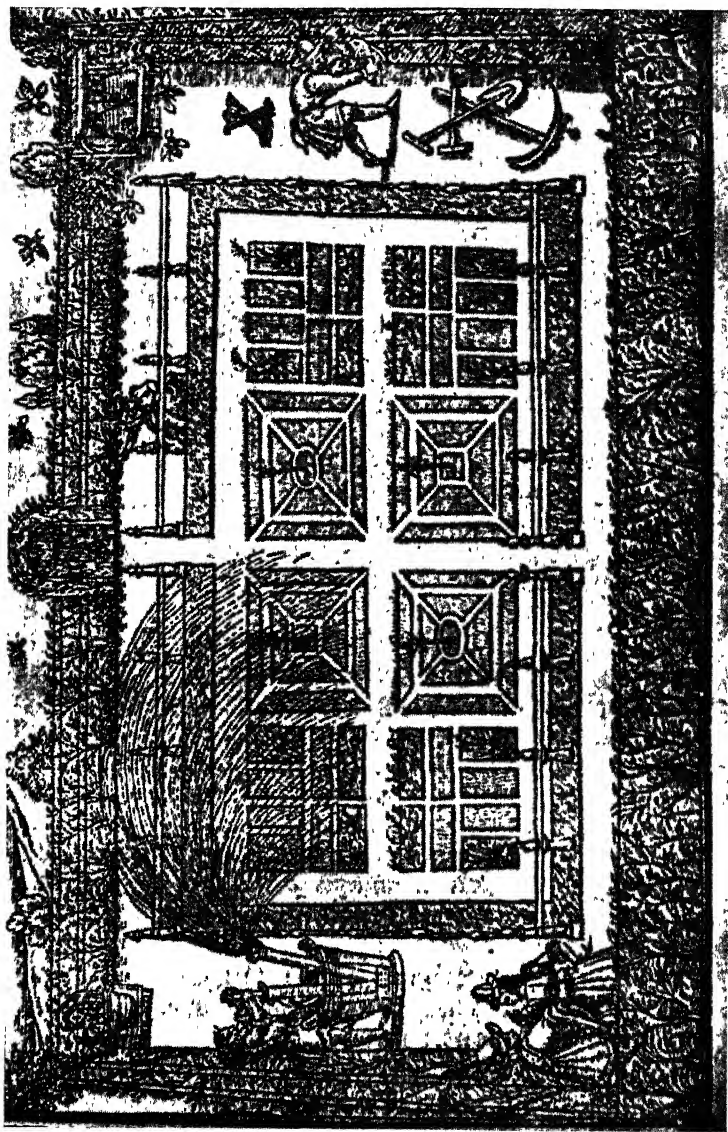
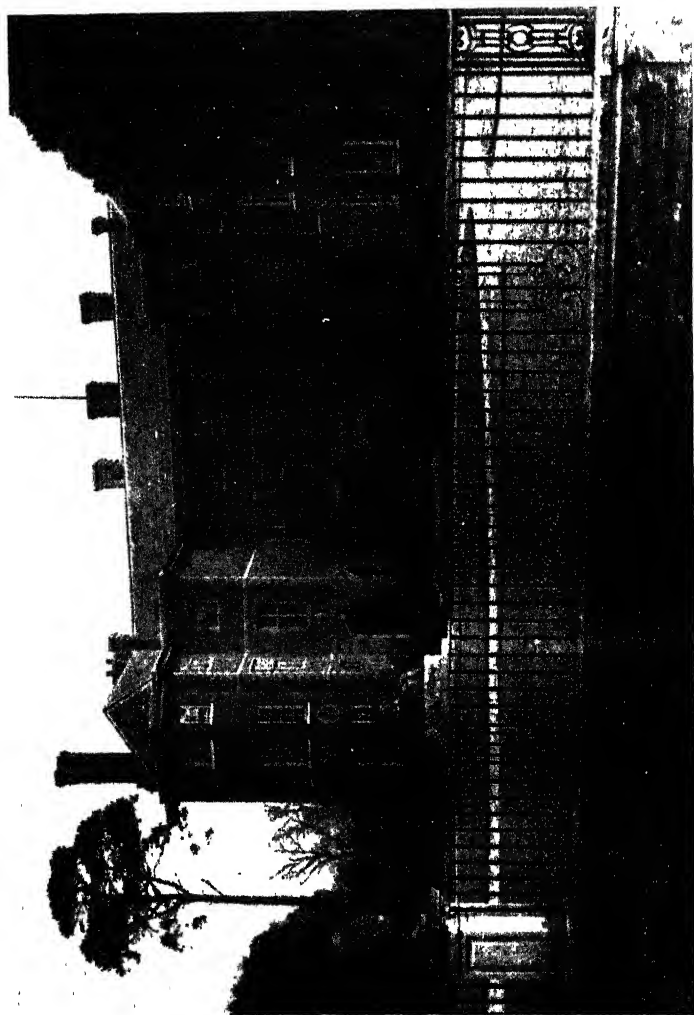


FIG. 73.—WATERING AN ELIZABETHAN GARDEN.

[To face p. 216.]



[Copyright "Country Life,"

FIG. 74.—HAM.



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FIG. 75.—ENTRANCE. HAM.

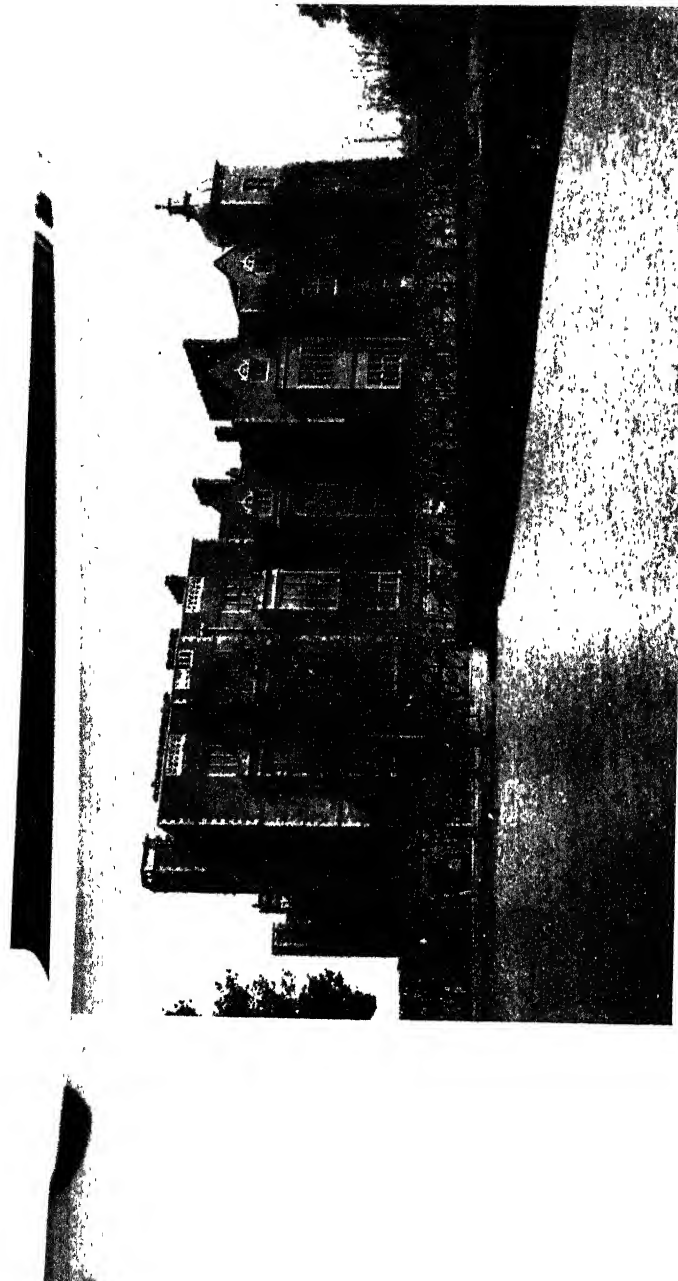


[Copyright "Country Life,"

FIG 76.—CRANBORNE.



FIG. 77.—THE MOUNT.



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FIG. 78.—HATFIELD.

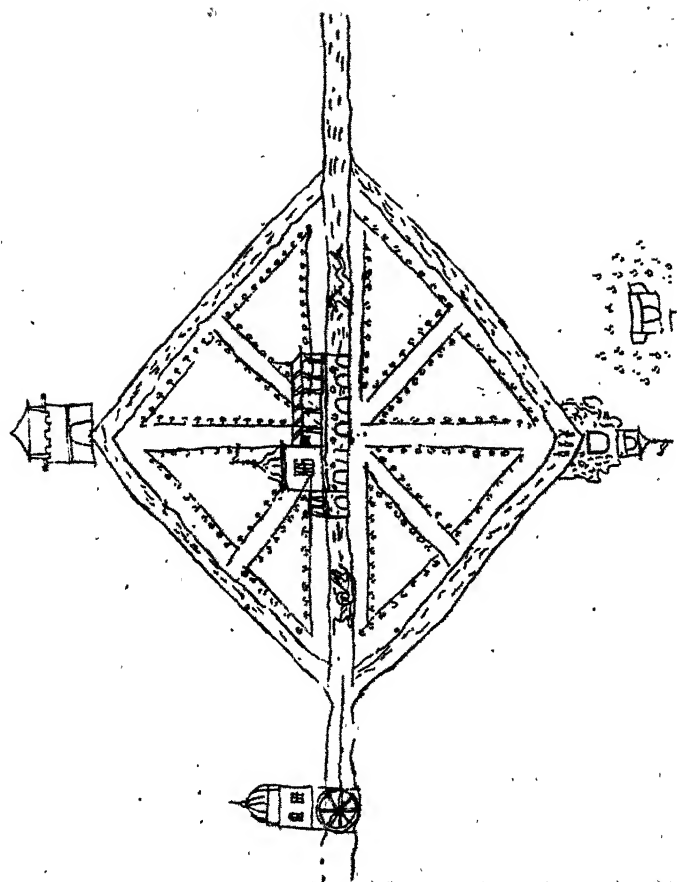
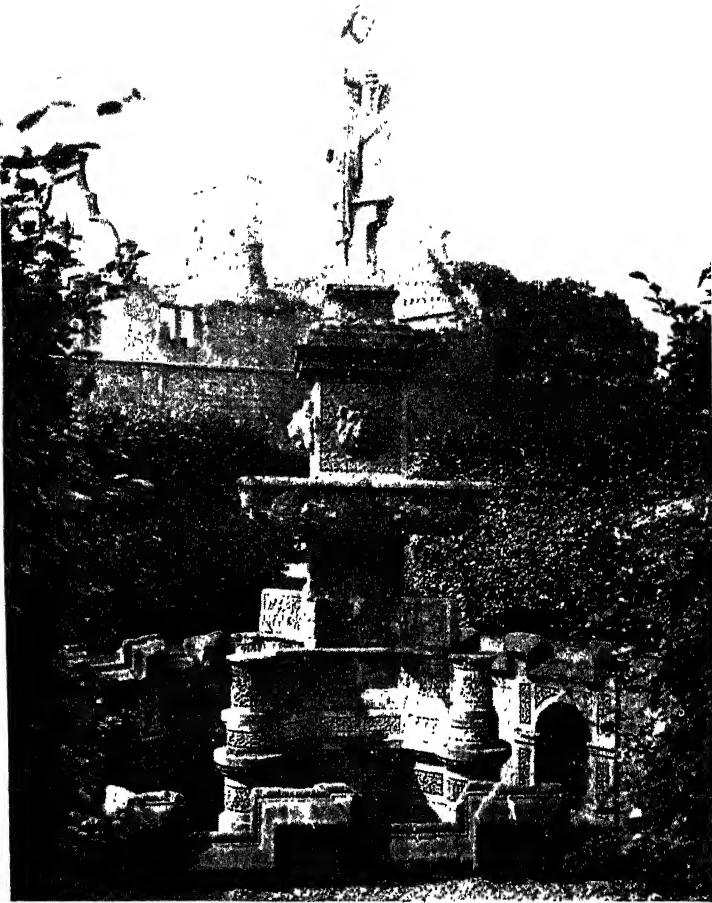


FIG. 79.—THE FORCE, HATFIELD ; DRAWN BY SALOMON DE CAUS IN 1610.



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FIG. 80 —FOUNTAIN AT BOLSOVER.



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FIG. 81.—THORPE HALL, PETERBOROUGH



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FIG. 82.—THORPE.

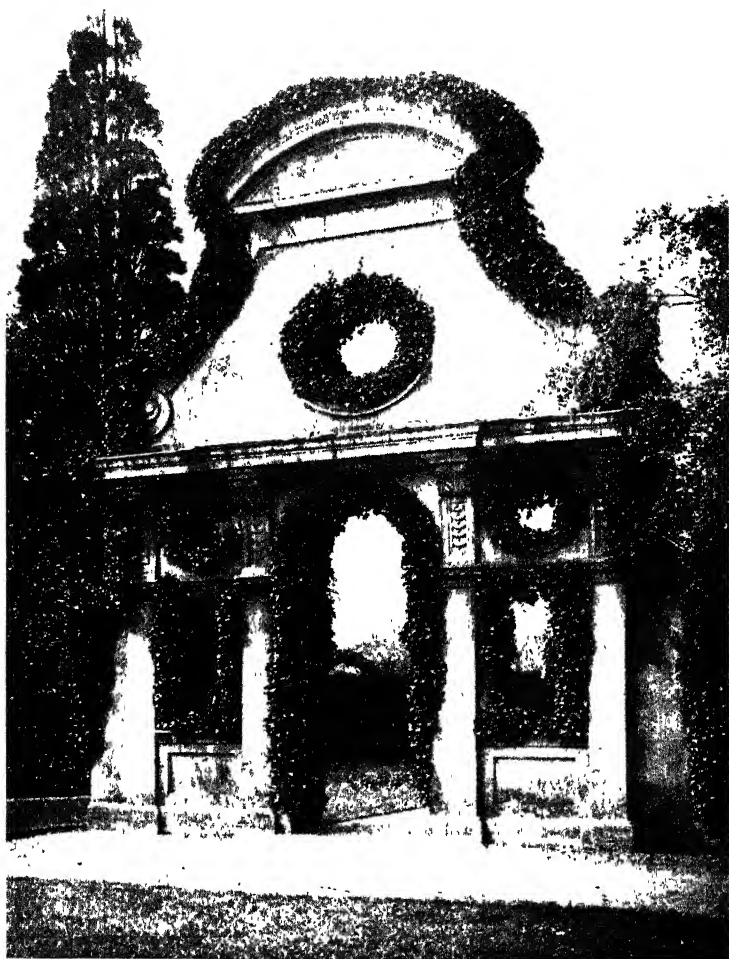


FIG. 83—THORPE.

[Copyright "Country Life."]

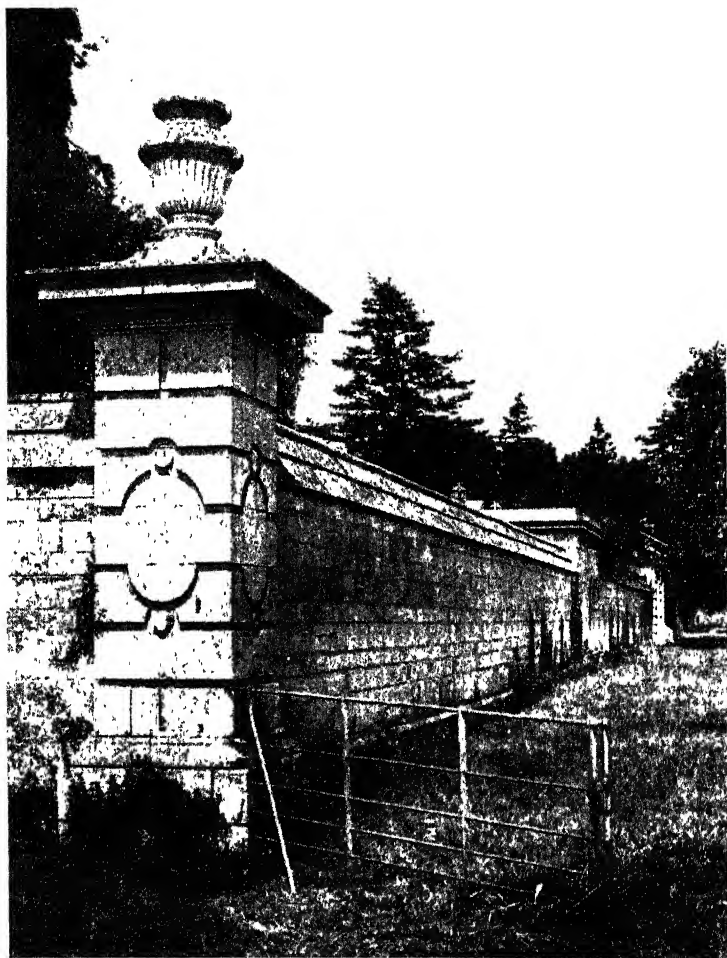


FIG. 84.—THORPE.

[Copyright "Country Life."]

[To face p. 217.]

relieved by fountains. Through the second runs the river Nadder, its windings disguised by formal plantations of trees with long tunnels of verdure at the outer edges. The third has still more architecturally treated covered alleys—very similar to those of DE VRIES's design—flanking a scheme of ovals with central statue. Beyond that the broad walk leads to a building which extends right across the garden and, no doubt, contained the water works which were still perfect when CELIA FIENNES visited Wilton a little before the year 1691.

The central part of the building will have been a grotto replete with DE CAUS ingenuities, so that "at Ye Artists pleasure" he could spout unexpected water over the visitor, although this supreme achievement of the seventeenth-century water engineers was best reached in "two little roomes which by the turning their wires y^e water runnes in y^e rockes—you see and hear it and also it is so contrived in one room y^t it makes y^e melody of Nightingerlls and all sorts of birds w^{ch} engages y^e Curiosity of y^e Strangers to go in and see, but at y^e Entrance off each room is a line of pipes that appear not till by a Sluce moved it washes y^e spectators designed for diversion."

Such trivialities do not seem to have been to SALISBURY's mind, We hear nothing of them at Hatfield, but much of the utilitarian side of gardening. Vineyards had been attached to most of the southern monasteries of England, but PARKINSON tells us in his "Paradisus" published, as we have seen, in 1629: "The grapes of the best sorts of Vines are pressed into wine by some in these dayes with vs, and much more as I verily beleue in times past, as by the name of Vineyard giuen to many places in this Kingdome, especially where Abbies and Monasteries stood, may bee coniectured: but the wine of late made hath beene but small, and not durable, like that which commeth from beyond Sea, whether our vnkindly yeares, or the want of skill, or a conuenient place for a Vineyard be the cause, I cannot well tell you."

SALISBURY, however, allocated a situation above the "Force" island for a large-scale attempt at grape growing. In February 1611 WILSON writes to him that Mme. DE LA BODERIE, wife to the French Ambassador, had sent 20,000 vines, and that 10,000 more are coming. WILSON estimates them as being worth eight crowns a thousand. He will see to all prepared ground being planted with them, and for the rest he will "make a nursery of them set thick together."

Late in the year we find two Frenchmen, COLLIN and VALLETT, engaged in the vineyard, and after that they are paid respectively £3 5s. and £2 10s. a quarter for "dressing vines & looking to the vineyard." It is hedged in with privet and sweet briar, and we find it afterwards alluded to by FULLER and PEPYS. But by 1700 this attempt to grow outdoor grapes on a large scale in Hertfordshire had been abandoned, and we hear of the area being laid out in lime-tree walks.

Vines, however, were only one branch of SALISBURY's extensive fruit programme. Five hundred fruit trees are sent over for Hatfield

as a present from the French Queen, accompanied by two gardeners to "see to the setting and bestowing of these trees." But an even more important horticulturist has the chief charge of procuring and setting both fruit trees and flowering plants.

JOHN TRADESCANT is more likely to have come from a Low Country than from an English stock, but in 1607 he married a Kentish maiden. Four years later SALISBURY sends this man, whom PARKINSON describes as a "painfull industrious searcher and lover of all nature's varieties," to the Low Countries and to Paris to purchase all that Hatfield still needed. The bill he afterwards sent in not only mentions each item of his purchases, but also his route, his travelling expenses and several of the nurserymen with whom he dealt.

To get to Flushing was cheap but arduous. He starts from Gravesend, which he reaches at the cost of sixpence, but then has to pay two shillings "for four days lodging and dyet at ramsgat by contrary wind." From Flushing he goes to Rotterdam, The Hague, Leyden, Haarlem, Amsterdam and Utrecht, after which the return journey with the purchases begins, so that we get such items as: "From leydon to delphe by watter withe the baskets and pots, 1s. 2d.; on diner in leydon, 1s. 0d.; for carig of those baskits, and pots in delpthe and my lodging, 4d.; for my supper and loging theare, 1s. 3d.; for my passag to Rotterdame, 6d."

At Rotterdam he no doubt saw to the shipment of his Dutch purchases. From DIRRYK HEVESSON of Delft he had bought three of a new early fruiting Cherry, the Rathe Ripe, at 3s. a piece, "and 2 trees called the vulgars cheryes" at 1s. 6d. each.* Here, too, he obtained Quinces, Medlars, Pears and Apples, while elsewhere he bought not only fruit trees but some of the plants and bulbs that were coming from various parts of Europe and Western Asia to Low Country ports and to Paris, rather than to London. What they were we know from PARKINSON, the apothecary, whose Long Acre house had a garden "of all sorts of pleasant flowers" and whose "Paradisus" has a chapter on "The nature and names of diuers Out-landish flowers, that for their pride, beauty, and earlinessse, are to be planted in Gardens of pleasure for delight." Many such did JOHN TRADESCANT collect on his journey for "my Lo:" of Salisbury. At Leyden he gives £3 "For routes of flowers and Roasses and shrubs of Strang and Rare." There, also, to "on phalkner" (one Faulkner is, no doubt, intended) he pays 26s. for "two pots of gilliflowers 12 sorts in one pot and of seed gilliflowers plants in on pot." As PARKINSON tells us that "Carnations and Gilloflowers bee the chieftest flowers of account in all our English Gardens," TRADESCANT has an eye to acquire as many varieties as possible by purchase or gift, one of his triumphs being in Paris, where "on pot of gilliflowers, cost nothing." Of CORNELLIS CORNELLISSON in Haarlem he buys "Junkillis ampto calce, 40 at 3 pence the peece." They would be our larger Campenel Jonquil, which PARKINSON

* Celia Fiennes, in 1697, noticing the Kentish orchards between Rochester and Gravesend, for the supply of London, calls them "a good sort flemish fruit."

illustrates and calls "*Narcissus Iuncifolius maximus amplo calice*. The great Iunquilia with the largest flower or cup." TRADESCANT also gives 5s. for "flowers kalled anemonen," and 3s. apiece for "forteye frittlearies," but which of the many Anemones and Fritillarias that PARKINSON includes these may have been we cannot tell. We can, however, securely place "the dubble Epatega" that he buys at Brussels of "Mr. JOHN JOKKETT," for PARKINSON tells us that "The double Hepatica is in all things like vnto the single purple kinde, sauing onely that the leaues are larger, and stand vpon longer footestalkes, and that the flowers are small buttons, but very thicke of leaues, and as double as a flower can be, like vnto the double white Crowfoote before described, but not so bigge, of a deep blewe or purple colour, without any threads or head in the middle, which fall away without giuing any feede."

From Mr. JOKKETT TRADESCANT also obtains "the martygon pompone blanche, the martygon pompony orang coller and the Irys calsedonye and the Irys Susyana."

What success TRADESCANT had with *Iris Susiana* at Hatfield we can guess from our own experiences with the Mourning Bride. PARKINSON shows prudence in omitting cultural directions for this difficult subject, but in his chapter on "The Flagge or Flowerdeluce" he writes, "first of that Flowerdeluce, which for his excellent beautie and raritie, deserueth the first place, *Iris Chalcedonica siue Susiana maior*," which he elsewhere calls the "Flowerdeluce of Constantinople or the mourning Sable flower." After dealing with it he passes to "*Iris Chalcedonica siue Susiana minor*. The lesser Turkie Flowerdeluce," which he describes as "little differing, but that the leafe is of a more yellowish greene colour, and the flower neither so large or faire." The first of them is prominent in PARKINSON's plate of four members of the family.

Tulips had reached England a score of years before TRADESCANT was buying for Hatfield, and that the rage for them soon passed from the Continent to England we can judge from the illustration in the 1616 edition of CRISPIN DE PASSE'S "Hortus Floridus," printed in English although published in Utrecht. Again we have a thoroughly DE VRIES-like enclosure of a gallery with caryatids supporting an arched framework covered with verdure. It gives privacy to a parterre set with bulbous plants—there are Lilies, Crown Imperials and Irises, but very prominent are the Tulip beds. We find TRADESCANT buying Tulips at 10s. a hundred—800 at Haarlem and 500 at Brussels. No doubt there were both species and garden varieties, for there had been so much importing and hybridizing that PARKINSON exclaims, "to tell you of all the sorts of Tulipas (which are the pride of delight) they are so many, and as I may say, almost infinite, doth both passe my ability, and as I beleue the skill of any other."

TRADESCANT did not go home with his purchases from Rotterdam, but took seven days going by water to Antwerp, whence he went to Brussels, and after doing some collecting there went on to Paris, where

he got "my Lord Imbassettors gardner to goe withe me two and fro in parrys to by my things," and gives him a crown. Some of his Paris purchases are of rather delicate subjects. He buys "orrange trees," some at 10s. and some at 8s. apiece; "pomgranet," "olly-ander," "myrtill" and white Figs at 2s. 6d. each. But next comes an expensive article: "on fyg tree in a pot by it Selfe bearing 3 times a yeere o. 12. o."

With his Paris purchases he is going home down the Seine to Rouen and "to put into the same boat" he buys Plum and Cherry trees, and, to further stock the vineyard, he procures Muscat Grapes and "Vyens called Lurdlet." He was an assiduous collector of various kinds of vines, so that PARKINSON tells us that "Iohn Tradescante, my verie good friend so often before remembered, hath assured me, that he hath twentie sorts growing with him, that hee neuer knew how or by what name to call them." TRADESCANT'S purchases at Rouen of further fruit trees, especially of Peaches and Mulberries, completed the noble provision that he made for the Hatfield orchard and gardens.

From Rouen he takes horse to Dieppe and thence he sails to Dover. The trees presumably came all the way by water to London and occasion the following disbursements: "Item to be given to the boyes of the ship to be careful of the trees, 1s.; also spent on the frenche men the Kings gardners in onlodying the trees abors the shipe, 3s.; given to the two wherryes to bring the trees to the gardin, 3s."

They would be landed at the bottom of the garden of Salisbury House in the Strand, almost next to which was Somerset House, whence, or from Whitehall, the French gardeners employed by our King and Queen could easily come and help the unloading below London Bridge.

TRADESCANT will not merely have seen to the planting of all he had collected at Hatfield, he will have had some continued superintendence over the gardens there, as he procures "a sythe to mowe the Coorts and East garden," gets baskets to bring down melon plants, and has "24 erthen panns for the covering of the melons," which looks like the origin of our sea kale and rhubarb pots. For a while he continued to serve the second earl, as he sends in a bill as late as November 1613. After that he went on collecting expeditions which, in the case of Algiers, was of a warlike character against the corsairs. But he brought home the 'Argier Apricocke' when, as PARKINSON explains, he "went voluntary with the Fleete that went against the Pyrates in 1620." Next he served VILLIERS, Duke of BUCKINGHAM, and finally CHARLES I. He settled in Lambeth, where he had a physic garden and museum, and was succeeded in 1637 by his son JOHN TRADESCANT, junr., who was then in Virginia "gathering all varieties of flowers, plants, shells, etc." Shells were then much collected, and TRADESCANT the elder had bought several for SALISBURY. The Lambeth collections of shells and other curiosities were left to ASHMOLE, who transferred them to his new museum at Oxford together with the portraits of the

TRADESCANT family, of which that of the father is enclosed in a curious cartouche painted with carrots and tulips.

The high situation and open view of SALISBURY's site for his new house obviated the necessity for one or two of the features to which the makers of the enclosed gardens—such as we have seen drawn by DU CERCEAU and DE VRIES—had recourse to obtain outlook. They were the mount and the raised boundary walk. Both of them find place in BACON's scheme for a princely garden.

We have seen that LAWSON suggested a little arbour-capped mound at each corner of his garden. That was cheaper to realize on paper than in practice, and I know of no case where it was adopted. Among early mounts, that piled up under HENRY VIII at Hampton Court was the largest and most elaborate. In WYNEGAARDE's drawing—a large copy of which was exhibited here eighteen months ago—it appears behind the Water-Gate building. Its winding ascent was marked by a circling avenue of posts with heraldic animals—the King's beasts, as they were called. On the mount was a balloon-roofed "Great Arbour" three storeys high. BACON's, topped by "Some fine Banquetting House," was to occupy the centre of his main garden, and this is where we find such located at New College and at Wadham College in Oxford. That at Wadham dates from about 1645, and what it looked like thirty years later we know from LOGGAN's engraving. It was ascended by a broad set of steps leading to a flat on which stood a huge figure of Atlas. KIP's view of Dunham Massey shows one—the substance of which survives—with winding paths up it and a little garden house on top. At Northbourne in Kent, at Littlecote in Wiltshire, and at Little Moreton Hall in Cheshire we find remains of the like, whilst for the conversion into such of ancient castle mottes or mounds I may instance Rockingham and Bedford. How elaborately they could be designed—and probably carried out—on the Continent we may judge by the one engraved by ROMAIN DE HOOGHE for the *Parc d'Enghein* (fig. 77).

The raised boundary terrace was a device for peaceful outlook founded on the earlier defensive rampart walk. Thus BACON proposed to raise the ground behind part of his enclosing wall so that, high as this might be on the outside, on the inside it would be no more than breast high, so, as he says, "to look abroad into the Fields." Thus complete privacy reigned within the garden, and yet those in it might at will satisfy their curiosity as to what was going on without. We find such at Montacute and Severn End, at Loseley and Packwood, while another, very finely designed, survives at Thorpe.

Thorpe Hall, near Peterborough, was built in Commonwealth times by a Cromwellian lawyer, Chief Justice ST. JOHN. The general plan of the lay-out reminds us of those at Wollaton, Ham, and Cranborne, by its perfect rectangularity and its system of division. The whole substance, alike of the house and garden architecture, is of fine ashlar stone. The forecourt is entered through gates flanked by splendid niched gateposts (fig. 81). The great enclosing wall is broken

by other gateways (figs. 82, 83) and by finely conceived and wrought corner piers (fig. 84). A slight drop in the ground suggested extra height for the wall of the south boundary of the enclosed garden, and in front of it will have been either an orchard or the "heath or desert" that BACON had suggested "at the going forth" from his main garden. To enjoy this at Thorpe, niches contrived as seats were sunk into the wall in pairs at intervals. On the garden side of the wall, as BACON had proposed, the ground was raised to form a broad outlook terrace, reached up a flight of steps, at the foot of which is a little garden house, while a larger one, of gabled form, was set in the centre of a low range of buildings opening, on the other side, into an extension of the stable-yard. This garden house has long been ruinous, and I fear this is by no means the only loss that Thorpe has suffered. Yet, as the perfect realization of a completely conceived English country seat of mid-seventeenth-century date, Thorpe is a national treasure of the utmost value. It closes the period which we have been surveying, and with it I bring my remarks to an end.

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A SHORT SURVEY OF THE GENUS VIOLA.

PART I.—THE NOMIMIUM AND DISCHIDIUM SECTIONS.

By LIEUT.-COLONEL E. ENEVER TODD, O.B.E., M.A., R.A.P.C.

As the genus *Viola* embraces upwards of 500 species, even a short survey must be rather lengthy. A large amount of research has been going on since the beginning of the century, with two concurrent results: first, that many names have been determined to be synonyms; secondly, that numerous new species have been described for the first time. It seems probable that a number of the latter will prove to be not markedly different from older species; but on the other hand the discovery of new species appears by no means to have come to an end. The difficulty of classification will be evident from the fact that, for some 500 species, there are from 2,000 to 2,500 names (and this excludes another host of names given to hybrids). Unfortunately, the manufacture of synonyms still proceeds. An explorer, for example, no further away than the Balearic Islands, comes across a Violet which he or she, with an imperfect knowledge of the whole of the literature of the genus, cannot exactly relate to any known species: immediately a new name is published. A still more substantial difficulty is that, in place of there being 500 clear-cut species, there exists in reality a gradation from one to another in which the steps are sometimes close and sometimes far apart; and accordingly in order to distinguish the wood from the trees, it is easier to think of types or "collective species" than of individual species, even though such a "collective species" may not actually correspond to any given plant in nature. It is with such types that I will attempt to deal, associating with each the name of the principal species representing it.

THE NOMIMIUM SECTION.

The Nomimum section comprises about 238 species, divided into 17 groups, several of the groups being again divided into two, three, or four sub-groups. *Nomimum* is a Greek word meaning "usual," so that this section may be said to include the flowers that are usually or conventionally called Violets. It is by far the largest section, the *Melanium* section, including what are conventionally regarded as *Violas*, coming next.

i. *V. odorata* L.—The most widely known, though in nature not the most widely spread, Violet is of course the Sweet Violet. Its violet or lilac blooms are known to everyone, but less familiar are its colour forms—purple, white, pink, red, violet with white edge, or yellow with violet spur, the last an especially pretty form. The broad

reniform leaves, the long slender stolons rooting at the nodes, and the short, broad, and shortly fimbriated stipules are the principal characters. Its area is most easily understood by delimiting its southern frontier—from the Canaries westwards through Morocco, Sicily, Crete, the Crimea, the Lebanon, Caucasus, and Iraq to Turkestan. North of this line it is found only in Europe, excluding European Russia. It is thus a plant of warm temperate climates. Elsewhere in the world, though widespread, it has been introduced. An eastern extension of the area is given by *V. indica* W. Bckr., from the North-West Frontier Province along the Himalayas to Sikkim. Here it ascends to high altitudes, e.g. 10,000 feet in Kashmir.

2. *V. sepincola* Jord.—When the stolons become short and thickish; the leaves ovate; the stipules lanceolate and longly fimbriated; the bracts on the pedicel below instead of at or above the middle; the spur short (not long); the auricles touching (not standing away from) the pedicel; the seed capsules glabrescent rather than pubescent; and the blooms white to nearly half their length in place of having a small white eye; then we are in the sepincola group, so called owing to JORDAN's plant from Spain and France being the best known, though this and others are rather localized species in Europe, whereas *V. pontica* W. Bckr. extends over a much wider area than any other, from the Crimea to Kashmir.

3. *V. alba* Besser.—Again, when the stolons are ascending instead of prostrate, and hence not generally rooting at their tips; when also they bear flowers instead of all the flowers being radical; the stipules become narrower still to the point of being linear; and the leaves become more triangular and rough with adpressed hairs; we come to a group of which *V. alba* is typical. This is not the white variety of *V. odorata*. The variations of the leaf-form defeat systematization; but roughly in the South-European form (sbsp. *Dehnhardtii*, from the islands and northern shores of the Mediterranean) the leaves are rounder, and in the Eastern form (sbsp. *Sintenisi*, from pomegranate groves in Persia and gardens at Samarkand) they are more pointed; but in the type itself (north of the *Dehnhardtii* line and then east to the Caucasus) they vary indefinitely between these. The colour is generally violet, despite the name, Besser's type having been described from the usually white form of Northern Europe. But, as with *V. odorata*, there are many colour forms, including MOGGRIDGE's var. *picta* from the Riviera, with white petals edged with lilac. There are also named forms varying in colour of leaf, as JORDAN's *V. scotophylla* with violet-black leaves.

At this point we leave the Sweet Violets proper.

4. *V. hirta* L.—The group centring round *V. hirta* might roughly be regarded as the Sweet Violets without stolons, except that *V. hirta* itself is scentless (but the others are fragrant), and that, in order that the transition may not be too abrupt, they develop short and more or less upright turions in place of stolons. Otherwise, in the flowers being radical, in the stem of the capsule being radical and curving towards the earth, and in the beak of the stigma being uncinatate, they are closely

allied, though in general appearance very distinct. In their distribution, too, they are similar, but here, for the first time, we get violets which are strictly alpine (*V. pyrenaica* Ram. and *V. Thomasiana* Perr. and Song.). *V. pyrenaica* is very spasmodic, occurring here and there from the north of Spain (where it flowers on the snowline on the Picos de Europa) over the main Central European ranges. In this the capsule is quite glabrous; in all the others the capsule is hairy. *V. Thomasiana* is not more than three inches high, and is confined to the Western and Central Alps. The area of the group is distinct from that of the Sweet Violets in being carried to the Far East and into Northern Asia, the type species extending from the South of England to mid-Siberia. The eastern forms of *V. hirta* are not very clearly distinct from *V. collina* Bess., which has very hairy, more deeply cordate, brighter green, more deeply crenated leaves, as well as other minor distinctions, and is an exclusively limestone plant, not occurring in Western Europe, but otherwise belonging to the same area as *V. hirta* and carrying the group past *V. hirta* into Korea and Northern Japan, where it hands over the running to *V. hondoensis* W. Bckr. and De Boiss., this being a *hirta* species with reniform leaves. Colour forms occur in all these, though I do not think reds or yellows occur except that the spur is sometimes yellow.

THE ROSTRATAE VIOLETS.

All of the foregoing belong to the Uncinatae, the beak of the stigma being hooked. The Wood and Dog Violets are the Rostratae. Violets cannot be classified without consideration of the form of style and stigma, though it does not follow that these are an exclusive or determining diagnostic. Here again the transition is not abrupt, only *V. rostrata* Pursh itself being strictly not uncinata. The others of the Wood and Dog Violets have the beak shortly hooked instead of longly hooked as in the Sweet Violets. In habit, however, the Rostratae are quite different, the plants being caulescent, not acaulous; and the fruit springing from the leaf axils, not from the rootstock.

5. *V. mirabilis* L.—There is an exception to every rule, and in this case *V. mirabilis* is at first acaulous and only later caulescent. This Violet presents a remarkable concatenation of peculiar features, whence the name, which means "surprising," and not "admirable" as some have supposed. The plant as a whole is pale green, and is about 18 inches tall; the young leaves are rolled up like a paper screw, but later are large and reniform; the flowers are bright blue, densely bearded and very fragrant, with greenish-white spur; the stems are densely leafy at the top but carry only one leaf below; the stipules are quite entire, the lowest scale-like and brown, the others green; and the plant may have long-stemmed radical blooms or shorter-stemmed cauline blooms or cleistogamic blooms from the upper axils with hardly any stem at all. It is a limestone plant, common to Central Europe, and then crossing from the Caucasus to Japan. *V. Willkommii* De Roem., a kindred localized species, particularly abundant

on Montserrat above Barcelona, is from its description outstandingly beautiful; and the only other relative is *V. pseudomirabilis* Coste, found as yet only in one place in France and one place in Serbia—an example of the interesting distribution occurring in several genera, of an immense jump from the Iberian to the Balkan Peninsulas.

6. *V. rostrata* Pursh.—*V. rostrata* is clearly distinguished not only by the style being straight and beakless, but also by the extremely long spur. So distinct, indeed, is it that it has no synonym. Not a single botanist could mistake it for anything else. The large violet flowers with unbearded petals are carried well above the leaves. It is an erect plant, up to 8 inches, and grows in leaf-mould on shady hill-slopes along the eastern part of North America from Quebec to Georgia, rising, as so many American Violets do, into the mountains as it goes southwards. It is also reported from Japan—a fact which need not surprise, inasmuch as many Violets cross from the Old to the New World *via* the Bering Straits and, having reached Alaska, descend the western coast of Canada down to the Rocky Mountains and California.

7. *V. silvestris* Rchb.—This, the typical Wood Violet, appears to be confused in England with the Dog Violet. The Wood Violets are characterized by a central rosette of basal and usually long-petioled leaves. The Dog Violets, on the other hand, have no such rosette, but the stem goes vertically up from the rootstock instead of, as in the Wood Violets, a number of stems shooting out from the axils of the basal leaves. The flowers of *V. silvestris* are of medium size, purple, darker at the base, sometimes violet, lilac, rose, or white. It is predominantly European, and in Asia is found only in Kashmir. The nearly related *V. Mauritii* Tepl., with pale lilac flowers and stems that are leafless except at the top, carries the group across the Urals into Siberia and northern Japan. The Far East and Japan produce a number of localized species, a quite usual character of which is that they produce radical as well as axillary blossoms, and at first are acaulous and only later caulescent. The Wood Violets as a group frequent shady and damp places; but two at least of the Japanese representatives grow on sand-dunes near the sea. I rather think that the only fragrant Wood Violet is *V. grypoceras* A. Gray, with purple flowers and reniform leaves, which, starting in Japan, carries the area down into China as far as Hong Kong. There are two American representatives, but in place of crossing as usual from Asia to Alaska, they belong to the eastern coast of America. One, closely related to the Siberian *V. Mauritii*, stretches from Greenland to Northern Carolina. This is *V. labradorica* Schrank, a boreal and alpine plant, with few and small flowers which are often deep violet, reaching as far as the mountains of New England, where it gives place to its subspecies *conspersa* (formerly given specific rank), with larger and more numerous flowers of pale lilac. The other American Wood Violet is *V. striata* Ait., known in cultivation as an easy Violet, which smothers itself with creamy flowers, tinged sometimes with violet, from July until the late frosts, and whose decumbent stems, up to two feet in length, hang beautifully down a bank at eye level.

8. *V. Riviniana* Rchb.—The family of Wood Violets, however, divides itself into two branches. *V. silvestris* represents one branch ; *V. Riviniana* the other. In the latter branch the stems are numerous (instead of tending to be solitary, as in the other) ; the leaves are round (rather than ovate) ; the stipules longer, broader, and green (not short, narrow, and dark) ; the sepals broader and longer ; the auricles relatively large (not rudimentary) ; the spur thick, shorter, grooved, lilac or whitish (not long, slender, and violet) ; and the style thicker. *V. Riviniana* has pale-green foliage and large lilac flowers. A single plant growing at the base of a *Chimonanthus fragrans* had at one time over 350 blooms and formed one of the most brilliant sights of a Kentish garden. The species appears to be common in some woods in Kent. Its area stretches from Madeira over the whole of Europe, going further north than *V. silvestris*. In the Balkans it begins to take the form of the subspecies *neglecta* (formerly regarded as a species). In this form it is very common on the shores of the Bosphorus, near Constantinople, and thence crosses Asia Minor to Persia. Two related species carry the group into Turkestan, Kashmir, and the Himalayas. It reappears again in two forms from the region between the Amur and Japan, and is then taken across to the American Continent by *V. rupestris* Schm. This circumpolar species is perhaps still better known as *V. arenaria* and has smaller flowers than *V. Riviniana*, varying from violet to white. With wide lapses here and there it is common to most parts of the Northern Hemisphere, and is equally at home on the plains and in the mountains. Thus it is found in such diverse places as Teesdale in England, Gavarnie in the Pyrenees, Montserrat above Barcelona, the Forêt de Fontainebleau near Paris, the Mount of Ararat, in the Karakorams above 12,000 feet, the far north-east of Asia, Alaska, Central Canada, Maine in the east of the United States, Washington in the west, in the Sierra Nevada at 10,000 feet, and on the coast of California. The form most frequent in America is the subspecies *adunca* (again formerly reckoned a species). A plant so widely distributed must necessarily have accrued to itself a large number of local peculiarities and it is stated that a complete list of synonyms would embrace some fifty names ; but mercifully only two of the Americans, one from California, the other from Texas and other southern States, have been allowed to retain their specific identity.

9. *V. canina* Rchb.—The Dog Violets form the Arosulatae group, *i.e.* without rosettes of basal leaves. The Wood Violets are the Rosulantes, *i.e.* with rosettes. The leaves of the former tend to be cuneate or truncate ; of the latter, cordate ; and the flowers of the Dog Violets are generally smaller. *V. canina* itself has thick, dark, shining, ovate-oblong leaves, with small, shortly fimbriated, serrate stipules often entire on one side ; smallish blue flowers, often deep blue, whitish at the base and with short, whitish or yellowish spur. It varies very greatly. On dry, grassy pastures or on bare slate slopes (as it grows sometimes in Italy) it is dwarf, and the flowers seem to

spring from the rootstock ; in moist, shady places the stems reach a foot high and the flowers are clearly axillary. It is a plant of cold and temperate climates, extending from Greenland over Europe, but absent in the South. Where the leaves run down cuneately into the petiole there is a tendency towards the subspecies *lactea* (*V. lactea*), belonging to the Atlantic shores as in Cornwall, the French Landes, Galicia in Spain, and Cintra in Portugal. Where the leaves are more cordate, and all the features of the plant are larger and the leaves pale and less thick, we have the subspecies *montana* (*V. montana*), a Continental type from the Baltic and the Caucasus to Kamchatka in the Far East. In places, as in Scandinavia, these forms are distinct ; in others, as round the Lake of Geneva, they are inextricably mixed.

The canina type has other representatives—*V. pumila* Chaix with lanceolate leaves and winged petioles, almost equally widespread ; *V. Jordani* Hanry, well known on the Riviera at the base of the retaining walls of olive terraces, a tall plant with pale violet flowers and very leafy stems that jumps kangaroo fashion from South-East France to Kashmir ; and *V. micrantha* Turcz., another tall species with small white or pale blue flowers, with many varieties, from the Baikal Sea to China and Japan. It grows among the stones of a waterfall at Kiao-chow and on the flanks of Fuji-Yama.

10. *V. elatior* Fries.—The lanceolate leaves of *V. pumila* lead on to two very distinct species of the Dog Violet in *V. elatior* Fries and *V. persicifolia* Roth., of which the former has the distinction of being the tallest European Violet, perhaps the tallest of any except the shrub Violets of the Hawaiian Islands, or the climbing Violets of South America. It grows upwards of two feet in height. The leaves are longly protracted to the point, the stipules are large, equalling or exceeding the petiole ; the whole plant is rather ashy-grey ; the flowers large and bright blue, with white streaks at the throat ; the lateral petals are strongly bearded ; the spur is short, thick, and greenish ; and the capsule has inflated angles reminiscent of the calyx of *Gentiana angulosa*. It is a plant of damp, low-lying places, widespread in Central Europe and in Asia from Turkestan to Central Siberia. *V. persicifolia* (syn. *V. stagnina*) is nearly as tall, but the plant is pale or yellowish green, and the flowers milk-white and not so large.

THREE RARE VIOLETS.

Two species and one small group now lead on to the Bog Violets. The first of these is *V. uliginosa* Bess., the only representative of the creeping Violets, with stolons running underground and throwing up here and there radical leaves and blooms. Its area is peculiar—east of a line drawn from Sweden to the coastland of Trieste, but not further east than Moscow. Its violet (and sometimes white) blooms are frequent in ditches, bogs, or peaty meadows in Carniola, and in July the swamps around Lioubliana are so thick with it that it becomes the characteristic feature of the vegetation. *V. libanotica* Boiss.,

coming as its name implies from the Lebanon, as on Mount Hermon, where it grows on limestone alps and subalps, is the principal representative of the woody-rooted Violets (*Lignosae*). The root runs vertically into the earth and breaks at its apex into several heads of small ovate leaves which form mats through which the pale violet or white blooms just show. The only European representative is the very rare *V. chelmea* B. & H., with minute leaves and lilac flowers, from the higher rocks of Mount Chelmos in Greece, and a few other places in the Balkans. This, with *V. arborescens* (fig. 87), is, I think, the only European suffrutescent Violet, and *V. arborescens* does not belong to the *Nomimium* section. The last of these rare species is *V. Kusnezowiana* W. Bckr., from the region of the Amur, where it grows on river banks and among pine woods in mossy, rocky places in company with *V. biflora* and *V. epipsila*. It is not more than 4 inches tall and has the habit of *V. palustris*, with small, round yellow flowers, reniform leaves, a creeping root like that of *V. uliginosa*, and the swan's-neck style of *V. libanotica*.

THE BOG VIOLETS.

II. *V. palustris* L.—The Bog Violets, of which this is the best-known representative, are acaulous plants with creeping stolons, short spur, ellipsoid capsule, and disk-shaped stigma shortly beaked. The group was long thought to be circumpolar; but the discovery of some half-dozen species between the south of the United States and the north of South America dissipates the theory. All, however, belong to swamps, banks of streams, mossy ravines, damp meadows, and similar places. They divide themselves into two sets—the more numerous with round or reniform leaves, and the lesser number with leaves more or less longly lanceolate. The type of the latter is *V. lanceolata* L., in which the leaves are $2\frac{1}{2}$ to 6 inches long and taper into a winged and usually reddish petiole (fig. 85). This runs south from Nova Scotia over the Atlantic States. Three kindred species have leaves like those of the Primrose; of these *V. primulifolia* L. stretches from Florida to Texas; *V. occidentalis* Howell (fig. 85) frequents the coast of California; and *V. ecuadorensis* W. Bckr. is a native of Quito on the Equator, at about 9,000 feet. The long-leaf form becomes exaggerated in *V. vittata* Greene, with leaves like the frond of the fern *Vittaria*, 12 inches long and less than an inch wide (fig. 85). This, like the foregoing, is a southerner and a plant of the coastlands; and the tale of the southerners is completed by two little-known species, one from Vera Cruz (Mexico) and the other from Haiti in the Greater Antilles. The type of the former set, with round or reniform leaves, is *V. palustris*, with slender root, and leaves of thin texture, native to Greenland, common in Iceland, frequent in Northern and Central Europe, and in the south only at high altitudes as at 10,000 feet on the Spanish Sierra Nevada. It reappears from Alaska to Labrador, south to the Rockies in the West and the New England mountains in the East. Its place in Russia and North Asia is taken by *V. epipsila* Led. and a number of localized species.

some of which reach nearly to the Arctic Circle. Four American representatives are all northerners. The well-known *V. blanda* Willd., is Asiatic also, taking the usual course from Kamchatka and North Japan across to the region of the Mackenzie River and thence to Newfoundland. *V. renifolia* A. Gray, with no or rare stolons, occupies the same area in America, and frequents in particular mossy places in woods of *Arbor Vitae*, or sphagnum bogs like the great "Bottomless Pit" in New Hampshire. *V. pallens* Brain, goes further north, into Labrador, and is a species of colder or higher climates than *V. blanda* with which it is often confused. The latter may be distinguished from it by the pink tinge of petiole and pedicel, the purple spots on the capsule, and dark brown seeds instead of the green capsule and black seeds of *V. pallens*. Where these Americans go south, it is only into the mountains. The flowers of the entire group are in general small, those of *V. primulifolia* being probably the largest; and while they are pale violet in *V. palustris* and *V. epipsila* (with white forms in both), they are white in all the rest, usually with violet lines on the spurred petal.

THE ADNATAE VIOLETS.

The Adnatae group is so called by reason of the stipules being adnate to the leaf-stem to beyond their middle point. It consists of no less than some 73 species, the qualifying word "some" being here inserted as the place of several in the hierarchy is still very vague. Some are very close to each other; others are so unlike as to appear to the casual observer unconnected. Apart from the stipules, the characters of the group are that the plants are stemless and stolonless; the rootstock is generally vertical and branches at a point immediately below the place of origin of the leaves; and the stigma is flat, shortly beaked, and generally marginate. It thus follows on the Bog Violets by a natural transition, though these have stolons (but *V. renifolia* has not). The focal centre of the Adnatae is Eastern Asia, from which it radiates in three directions: first through the islands of the Pacific to New Zealand; secondly across the Bering Straits to America; thirdly along the Himalayas to the Caucasus and Transylvania. So large a group can only be dealt with piecemeal.

12. *V. Gmeliniana* R.S.—First there are five dwarf alpine species. Here the stipules are adnate almost their whole length, and the vertical root is almost undivided. They may be from 2 to $4\frac{1}{2}$ inches in height, with narrow to oval leaves, with violet flowers white or pale at the throat, and in the type species, *V. Gmeliniana*, intense violet. This comes from hill slopes in Eastern Siberia, descending possibly into China. Yunnan in South China has its own species, and *V. kunawaren-sis* Royle, the most widespread of the five, goes from West China along the whole length of the Himalayas to the Pamir and Turkestan, always at great heights, as at 15,000 feet in West Tibet. Two others carry the group westwards, as far as the mountains north of Mosul in Iraq, in fissures of limestone rock or in the earth-pans among those wild tangles

of rocks that seem to be the debris left over by the builder of the universe.

13. *V. Selkirkii* Pursh.—The second series of Adnatae Violets centres round *V. Selkirkii* Pursh. This forms a neat clump of erect, ovate, longly petioled and deeply cordate leaves, with long stipules, and light violet flowers borne on thickish pedicels, the petals being all beardless, the spur long, the auricles conspicuous, the sepals margined with membrane and the bracts carried at the middle of the pedicel. It is said to have been named after ALEXANDER SELKIRK, the original of Robinson Crusoe—why, I do not know, unless it be that this violet, like Crusoe, is a wanderer to far fields. The type was supposed to be circumpolar, but more recently new kindred species have been found, one growing upwards of 6,000 feet in shady gorges or on the sunless sides of water-courses in the Philippines; and the other high up on the mountains of Celebes, just south of the Equator. No fewer than eight near relatives have been named from the mountain woods of Japan; but *V. Selkirkii* itself ranges from Norway across Northern Russia to the Far East and North Japan (not going south except for a sporadic outburst in the Caucasus), appearing again in Greenland and Labrador, and then reaching across the whole breadth of Canada and finally descending the Rockies to Colorado. Like the others it frequents woods and shady ravines.

14. *The Patrinii Violets*.—The Patrinii Violets are by far the most numerous and widespread of the Adnatae. The type species, *V. Patrinii* DC., with long, winged petioles, rather sagittate leaves, black, thickish root, and white or pale lilac flowers, is in reality rather limited in area, stretching only from the upper waters of the Yenisei to the region of the Amur. *V. variegata* Fisch., a dwarfer plant of only 4 inches, with dark violet flowers and white throat, and round cordate, dark green leaves, purple beneath and pale green on the nerves above (whence “variegated”), begins and ends further to the east and also enters China. *V. phalacrocarpa* Maxim., a hairy plant a foot high, with deep reddish-violet blooms, has Korea for the centre of its area, and is very common near Yokohama. Several other more localized species are found here and there in the same region as the foregoing, and *V. prionantha* Bunge reappears far from its main home at high altitudes in the North-West Himalayas. This species, with lanceolate leaves and violet flowers, is said to be cultivated in Columbia (U.S.A.) under the name of *V. chinensis*, and it is perhaps this that has found its way into a European nursery catalogue. *V. Limprichtiana* W. Bckr., with large white flowers, brings the series southwards to Central China; others reach Southern China; thirteen related species have been determined in Japan, and seven in Formosa. The Formosan Violets have very small, round leaves barely $\frac{3}{4}$ inch long on $1\frac{1}{2}$ -inch petioles. They may not all be correctly linked to the Patrinii, and this may be true also of *V. flavida* Bur. et Franch., an ashy-grey plant with yellow flowers found in Tibet on the road to Lhasa (the only yellow-flowered Violet of this series).

15. *V. betonicifolia* Sm.—This, the most widespread of all the Patrini Violets, inhabits China, Japan, and Formosa, and then divides into two long lines—one south through the Philippines and Java to Eastern Australia and Tasmania, the other through Burma to



FIG. 85.—A, *Viola sagittata*. B, *V. occidentalis*. C, *V. lanceolata*. D, *V. vittata*. E, *V. pulvinata*. F, *V. ovalleana*. G, *V. rhombifolia*. H, *V. acanthophylla*.

[E, G, H are magnified; others reduced.]

Afghanistan and south over India to Ceylon. It is not surprising that, spread over so large a portion of the earth's surface, this Violet takes many forms, each given at one time or another a specific name. The Australian form is the original one, a rather downy plant, with narrow, oblong cordate leaves. *V. philippica* Cav. covers the same area but goes neither so far west nor so far south, stopping at Java and East India respectively. *V. inconspicua* Blume (syn. *V. apetalata* Roxb.) has substantially the same distribution as the last, but not further north



FIG. 86.—*VIOLA BIFLORA* NEAR NOTRE DAME DE LA GORGE.

[To face p. 232.]

than South China. It bears almost exclusively cleistogamic flowers, and is only worthy of mention in that, curiously, it has been introduced into cultivation and has been a puzzle to gardeners who were defeated in the attempt to catch sight of the blooms that produced so many seed capsules.

16. *V. macroceras* Bunge.—The westward trend of the Patrini Violets is continued by one little-known and one well-known species. The former is *V. kashmiriana* Bckr., a caespitose plant with ovate, multicrenate leaves and dark violet, scented flowers, from grassy places at 4,000 to 8,000 feet in the province which gives it its name. This and the next are, I think, the only fragrant Patrini Violets. The latter is the only European representative of the series, and in its European forms is known as *V. purpurea*, from the Caucasus, and *V. Jooi*, from Transylvania, the woods of the first and the limestone rocks of the second being its only Western homes. These have now been identified with *V. macroceras* from shady places on river banks in Siberia among the rocks of mountain torrents on the Altai, and from Tibet and the Himalayas. The leaves are roundly ovate, cordate, and longly petioled; the stipules white, membranous, and fimbriated; the flowers purple-rose or lilac, sometimes white; the capsule dotted with purple and the seeds purplish.

17. *V. bulbosa* Maxim. and *V. papuana* W. Bckr.—These are two Violets which only doubtfully belong to the Adnatae or, in fact, probably do not, and they have still to find their place in the hierarchy. The first, with its subspecies *tuberifera*, has as its chief character a bulbous thickening of the root. It is the type of several sharing this peculiarity, and all are stoloniferous above or below ground, which the Adnatae as a group are not. They extend from Kansu and Yunnan through Assam, Sikkim, and Tibet. *V. papuana* is so far an isolated species, not clearly related to anything else, native to Papua, that part of New Guinea which is mandated to the Australian Commonwealth. It is a plant with long, vertical root, stolons, dense rosettes of small papery rather leathery triangular cordate leaves, long low-lying stems, and large, pale violet flowers with long spur and filiform style.

18. *New Zealand Violets*.—Akin to the Adnatae, but very different from them in appearance, are three species from New Zealand and adjacent islands, of which the type *V. Cunninghamii* Hook. approaches most closely the Tasmanian form of *V. betonicifolia* (*V. Gunnii*). This also is found in Tasmania as well as in New Zealand and Chatham Island, and frequents the edges of brooks or sphagnum beds, ascending to over 5,000 feet. It is a very dwarf plant with creeping roots and very small leaves and small white or pale violet flowers. The nearly related *V. perexigua* Colenso is a heath plant, growing under *Leptospermum* scrub. Perhaps the smallest Violet in the world is *V. hydrocotylodes* Arnst., not clearly belonging here, a dwarf creeping plant with tiny reniform leaves $\frac{1}{4}$ inch in diameter, and white flowers $\frac{1}{8}$ inch long, found on the moors of Stewart Island. Here we verge on Antarctic flora.

19. *V. pinnata* L. and others.—The foregoing groups of the Adnatae Violets have all undivided leaves ; the last group, typified by the best known among them, *V. pinnata*, has divided leaves. The Pinnatae consist of six species, three of them rare in nature and little known, the others much sought after but difficult in cultivation. The leaves of all are primarily trisect ; the flowers are fragrant ; the spur long and rather thick ; and the root short with few fibres—the last a matter which may in part explain the difficulty of cultivation.

The European *V. pinnata* and its Asiatic subspecies *multifida* (commonly known as *V. dissecta* Ledeb.) are by far the most widespread. The general contour of the leaf is roundly ovate, the base being flatly cordate or cuneate, the lamina deeply pinnatifid into oblong or linear segments which are again incised. The flowers are pale violet, of medium size ; the bracts placed at the middle of the petiole ; the stigma triangular ; the capsule large and triangular ; and the seeds reddish-brown. Beginning in the Western Alps, it is rather localized in Switzerland and frequent in the Tyrol, whence it turns south to Carinthia and the hills of the Trieste littoral. It does not then recur west of Turkestan, at which point the subspecies takes up the running and continues along the entire frontier between Russian Asia and China as far as the Amur region, making as it goes incursions into Siberia on the one side and China on the other. The isolated appearance of *V. pinnata* in Europe, away from the main area of the group, recalls the similar appearance in Europe of the Asiatic *V. macroceras*, the only other European representative of the Adnatae Violets. The other Pinnatae Violets may roughly be regarded as offshoots or extensions of the principal species and the main area. Thus *V. dactyloides* R.S. is more eastern and is found along the Trans-Siberian Railway between Harbin and Vladivostock. Here the leaves are less divided, and divided digitately rather than pinnately. *V. incisa* Turcz. is a purely localized species of the shores of Lake Baikal, and has the leaves merely incised. Central China and the Salween-Chinkiang Divide have produced two little-known species ; but returning north to Manchuria, the eastward trend of the group is continued into Korea and Japan by the beautiful *V. chaerophylloides* (Reg.) W. Bckr. This is the most robust of all, rising to 10 inches when in fruit, and has very distinctive leaves ; primarily trisect ; the lateral segments bipartite ; the terminal segment bi- or tri-partite ; and all the segments either incised-serrate or again trifid. The bracts are below the middle of the pedicel and are exceptionally long ; the sepals have three conspicuous nerves ; and the auricles are large. The flowers are large, fragrant, violet or white, and in one form cream-coloured with soft rose calyx.

In nature *V. pinnata* grows on scree or sunny slopes in clearings of bushes, and is preferably, or only, calcareous. The subspecies frequents dry hillsides among rocks. *V. dactyloides* inhabits woods, especially birch woods. *V. incisa* is found in gravel or sand. *V. chaerophylloides* grows on sunny sandy ridges among rocks on the hills. So far as is known, therefore, the group is fairly unanimous as to what it likes.

20. *V. vaginata* Maxim.—From the Adnatae Violets we pass by an easy transition to a group of nine Japanese and Chinese species which, by reason of the broad chestnut vaginae or scales densely collected round the head of the rootstock, are called the “Vaginatae.” They differ from the Adnatae in other respects mainly by the stipules being brown and either free or adnate only at their lowest part; the short, thick scrotiform spur; the thick and densely fibred root; and by the sinus of the leaf being nearly closed. They are robust plants, with large pale violet flowers and large capsules on erect pedicels. They mostly belong to Japan, the type species being *V. vaginata*, with leaf and flower stem purplish, from grassy places under *Cryptomeria japonica*, while *V. Franchetii* De Boiss. grows among bushes along the railway bank near Saporu, where the Botanical Gardens are; and others carry the group down to Southern China.

21. *V. Langsdorffii* Fisch.—This and three other species form a group belonging to both the Old and New Worlds, crossing by way of the Bering Straits. Like the last, they are a race of large plants, up to 12 inches tall. They diverge from the preceding by being stemmed, the stems being decumbent or ascending, though they bloom also on radical scapes. The leaves are round or reniform. The type species begins in Eastern Siberia, and goes through Kamchatka, Sakhalin, the Kurile Islands, and the Japanese island of Hokkaido, then crosses *via* the Aleutian Islands (where the plant is small, without apparent stems) to the American Continent, and descends the entire coast to Northern California. It is a plant of swamps, with creeping roots. The coniferous woods of Vancouver and Oregon produce a rare relative in *V. Howellii* Gray, with flowers of deeper violet. The others are more localized, one, *V. moupinensis* Franch., being collected in 1906 by G. FORREST at the edge of the snows at 10,000 to 12,000 feet in Yunnan, a long way from the main route of this group.

22. *V. serpens* Wall.—An Indian group of some sixteen species is characterized by having long, slender, uniformly but remotely leaved stolons lying serpent-like along the ground. Otherwise they are stemless; the stipules are free; the leaves either round or ovate and acuminate; the style clavate; thus diverging greatly from the Adnatae. The flowers are white or pale lilac, but in one, *V. sumatrana* Miq., from Sumatra, yellow. Though mainly Indian, they branch off in several directions—to the Great Sunda Islands (Sumatra, Java, etc.); to Ceylon; and to Central China. All are plants of the high mountains, the higher the more southern the latitude, *e.g.* at 4,000 feet in Afghanistan and at 11,000 feet in Java. The type species, *V. serpens*, covers nearly the whole of the area named, is very common in Afghanistan, occurs near Darjeeling in the North and at Ootacamund in the South of India, and is again very common in the Javanese rain-forests. It is a denizen of gorges and the banks of streams.

23. *V. diffusa* Ging.—A small group of four species centres round this widespread Violet, which from Nepal goes eastwards to South China and then north to Formosa and Japan, and also south to the

Philippines. It is an annual, with small flowers, white or white flushed with violet. But in the mossy woods of the Philippines it appears to be perennial; and in 1900 E. H. WILSON found it in Central China both perennial and with conspicuous flowers. The leaves are small and round; the flowers are both radical and axillary from the ends of long, erect stolons densely leafy at their top, and rooting like those of *V. odorata*. Usually it is a weed of cultivated land. A form of it grows on the well-known Victoria Peak at Hong Kong.

THE AMERICAN VIOLETS.

The Violets of Canada and the United States number 75, to which, for the purposes of classification, should be added one species from Northern Mexico. Of these, 52 belong to the *Nomimum* section, and these 52 are divided into eight groups, some peculiar to the North American continent, others common to both the Old and New Worlds. Of these eight groups, by far the largest and the best known in cultivation is that to which BECKER has given the name 'Boreali-Americanae,' numbering 29 species. This group belongs predominantly to the Atlantic Basin, *i.e.* the States between the Atlantic seaboard and the 95th parallel of longitude. A few reach westwards to the Central Prairies: some are exclusive thereto; a few go south into Texas, Arizona, or New Mexico; and seven are, though not exclusively, Canadian. The Canadian Violets (this as a contribution to 'Empire Flora') are: *VV. palmata*, *septentrionalis* (fig. 87), *novae-angliae*, *nephrophylla*, *cucullata*, *fimbriatula*, and *pedatifida*. Apart from a few species which are exclusive to the Far South, *e.g.* Florida, and apart also from coastal salt-loving plants such as *V. Brittoniana*, the tendency of the group is the further south it goes, to frequent the higher altitudes, and in particular the long chain of the Appalachian Highlands. The group as a whole is acaulous and without stolons; the rootstock is short, thick, and fleshy; the leaves are long-stemmed and die down in winter; the flowers are always some shade of blue (though white forms are frequent but not typical); the lateral petals are bearded; the style is only slightly curved towards the base, with flat top and short frontal beak.

CLEISTOGAMIC FLOWERS.

This American group separates itself conveniently into three markedly distinct divisions by clear-cut characters. These are: (1) those in which the stem of the cleistogamic flower is short and prostrate and the seed capsule is purplish; (2) those in which this stem is long and ascending and the capsule more or less purplish; (3) those in which this stem is erect and the capsule green. The presence of cleistogamic flowers in most species of *Viola* has puzzled and sometimes even annoyed gardeners. A few Asiatic species have no chasmogamic flowers, and these are of course worthless for the garden. *V. pedata* (fig. 88, B), on the other hand, has no cleistogamic flowers; but

V. pedata seldom sets seed. What one loses on the swings, one gains often on the roundabouts. Petalliferous flowers in Violets are, as a rule, sterile; and in most cases the cleistogamic flowers are fertile. In this group, in any case, the latter form an indispensable guide to the species.

24. *V. palmata* L. (fig. 88, c) and *V. papilionacea* Pursh.—These I take as representatives of the first division; the former with divided

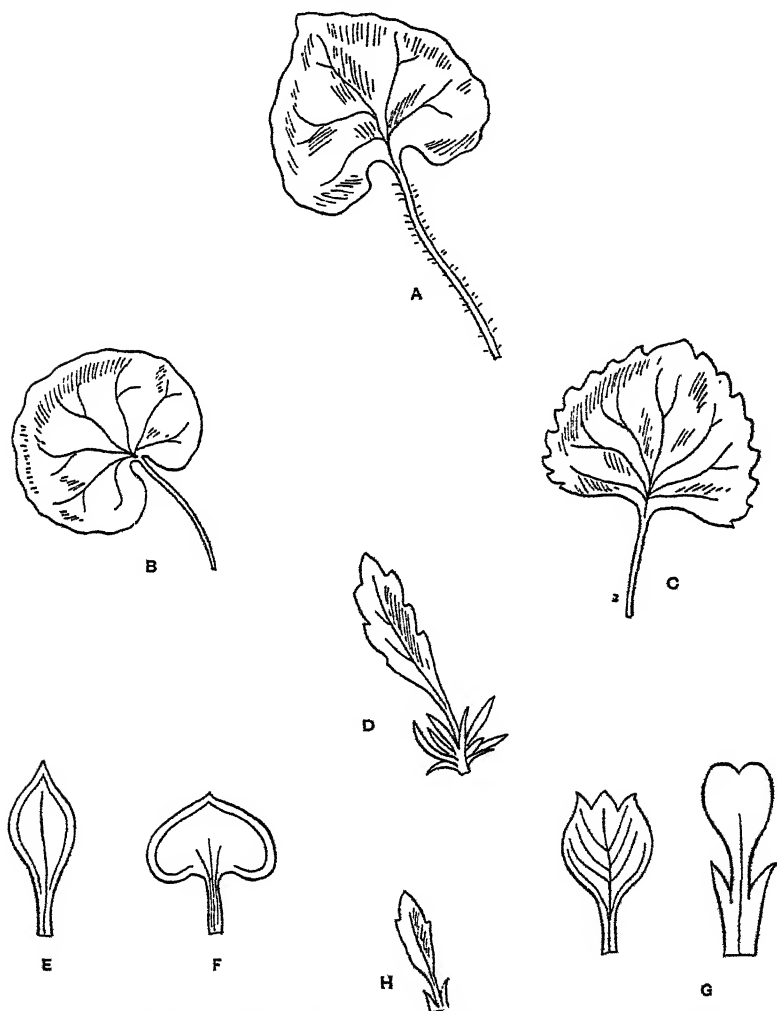


FIG. 87.—A, *Viola septentrionalis*. B, *V. biflora*. C, *V. pedunculata*. D, *V. declinata*. E, *V. sempervirens*. F, *V. atropurpurea*. G, *V. muscoides*. (two forms). H, *V. arborescens*.

[E, F, G, $\times 3$; others slightly reduced.]

leaves, the latter with entire leaves. If you find that your plant complies with the three criteria here indicated, you may be satisfied that it is *V. palmata*, inasmuch as the five close relatives of this Violet are

localized species or unlikely to have come into gardens through ordinary channels. Normally the leaf is divided palmately into 5-11 lobes, these being again cut or toothed, and the middle lobe usually the broadest and the general contour being ovate to reniform with cordate base; yet the leaf-form is so variable as to be either puzzling or useless as a diagnostic. The flowers are violet-purple, of good size, and show up well among the foliage. In nature *V. palmata* grows in dry, rich soil on wooded slopes. In Kent it has done well in full sun on a steep slope of rich loam, with the heat of the sun tempered by a large stone at its back. It makes a compact plant, beautiful in and out of flower. *V. papilionacea* is not so clearly typical. This also has violet-purple flowers, not unlike those of *V. palmata*, except that the throat is white and the spurred petal keel-shaped, the latter fact giving the name to the species. The leaves are ovate to reniform with cordate base, sometimes abruptly pointed, and often very large but not making quite such a forest as does *V. cucullata* in summer. There is a pure white form, stated to have been in cultivation for many years in Vermont, and used as a "cut flower." There is also an interesting form from Arkansas known as the Confederate Violet, its grey petals with purple centre reproducing the colours of the Confederate uniform. It is stated that this is a good garden plant; I once obtained seed under the name of *V. confederata*, but it came to nothing. *V. sororia* Willd. might equally be taken as typical of this division; it is densely pubescent (unlike the other, which is glabrous), and the 'Sister Violet,' so called owing to a fanciful resemblance to *V. odorata*, is a compact plant of easy growth with flowers of a very distinct bright blue. Where many are beautiful it is invidious to draw comparisons, and it is matter for surprise that many of the American Violets have not become garden plants in England.

25. *V. septentrionalis* Greene (fig. 87, A) and *V. novae-angliae* House.—The second division has all undivided leaves—except that two very localized species of Florida vary in this respect. If, then, you have a Violet fulfilling the conditions stated so far, and if in addition the under surface of the leaf and the petiole are pubescent, you may be certain that it is one of these two species. There is little to distinguish them in appearance or garden value—the leaves of the latter being smaller and narrowly ovate, and the sepals not ciliated, whereas in the former the leaves are broadly ovate to reniform, and the sepals, including the auricles, are finely and closely ciliated. Otherwise, the large violet-purple flowers are the same; and as both have in part the same area (the New England States), it would not be surprising if either were imported under the other's name. The only form of *V. septentrionalis* introduced to commerce in England is, so far as I know, an unusual white form with flowers streaked with violet. This has been called the 'Canadian White Violet'; but the pure white form is at least as common, and the type has flowers varying from deep violet to pale lilac. The type was originally collected in rich soil on the edges of thickets near Ottawa, and in Massachusetts it grows in

gravelly soil in clearings of groves of Arbor Vitae. In Kent it has waxed fat in the same position as that given for *V. palmata*. It has large attractive flowers on long stems; and makes a pleasant, compact clump of green about six inches high. A hybrid of this with *V. cucullata* which grows in Prince Edward Island is stated to be a Violet of remarkable beauty.

THREE MORE AMERICAN VIOLETS.

The third division, those with erect cleistogamic pedicels and green capsules, may be represented by *V. cucullata* Ait., with entire leaves; *V. pedatifida* G. Don (syn. *V. delphinifolia*), with divided leaves; and *V. sagittata* Ait., with leaves lobed at their base, but otherwise entire. The first is a plant of boggy ground on the banks of lakes and streams; it may be at once distinguished from the very close and even more widespread *V. nephrophylla* Greene by the long and slender cleistogamic flower and by the spurred petal being glabrous. In summer the large leaves are almost too luxuriant, but this may be only when growing in shade, and it is recorded that in Vermont "along a trout brook . . . at the base of the mountains, along the edge of the water, and in moist hollows, *V. cucullata* Ait. was common, with short petioles and peduncles when growing in the open, and with long petioles and peduncles when growing in the shade of alders." *V. pedatifida* has its leaves more divided than in any other Violet (fig. 88). Primarily three-cleft, each of the three segments is again trisected, and the nine lobes thus formed are themselves two- to four-lobed. The earlier and later leaves, as in so many American Violets which are conspicuous for this heterophyllous character, may not be divided to the same extent. The flowers are stated to be violet and showy; my only plant, on a hot slope in rich loam, has so far appeared smallish and of a rather washy purplish tinge. Two close species, *V. Brittoniana* Pollard and *V. septemloba* Leconte, are much to be desired; but the former, growing in moist sandy sea-soil along the Atlantic coast, and the latter, a southern from Carolina and Georgia, growing among pine needles, may not be easy. The third, *V. sagittata*, the Spade-leaf Violet, so called from the very distinctive shape of the leaf (fig. 85)*, grows in sandy soil on the shores of lakes. The oblong-lanceolate leaf, broadened at the base, and there, when mature, cut into lobes (but the earlier and late leaves merely crenate), has a long petiole as the handle of the spade. The flowers are stated to be violet-purple, but in BRAINERD'S figure they are pale bright blue. In places it is very abundant. "Thousands of plants," we read, "cover the ground with a blue carpet, mostly where the ground is a little low and damp." I have not succeeded in obtaining it, having received instead the less valuable *V. viarum* Pollard (fig. 88, D), a pretty and easy plant from the Central Prairies, but not so distinguished as other representatives of the American Violets.

26. *V. pedata* L. (fig. 88, B)—*V. pedata* is probably the most beautiful of the American Violets, and this is no mean tribute. It is monotypic, not associated with other cut-leaved species such as *V. pinnata* and

chaerophylloides. The plant is stemless, and without stolons ; the root is thick, fleshy, and vertical ; there are no cleistogamic blooms ; the leaves are primarily tripartite, each of the lateral segments again 3-5-partite, and the ultimate narrow lobes often toothed at their apex ;



FIG. 88.—A, *Viola pedatifida*. B, *V. pedata*. C, *V. palmata*. D, *V. viarum*. E, *V. Beckwithii*. F, *V. Hallii*. G, *V. lobata*.

[Slightly reduced.]

the blooms are large, the two upper petals dark violet, the others lilac, and all beardless ; the spur is short ; the anthers a conspicuous orange ; the style club-shaped and the stigma nearly beakless. It is, however, very variable, in size, colour, breadth of bloom, and leaf form. The concolor variety, in which all the petals are lilac, is the most common

form and is usually var. *lineariloba* DC., though in Florida and Louisiana large-flowered all-lilac forms are common, under the name of *V. ampliata* Greene, in which the breadth of the flower is as much as $1\frac{3}{4}$ inches. The Linnean species was the bicolor form; yet, owing to the erroneous description of the all-lilac figure in the *Botanical Magazine* (t. 89, year 1789) as *V. pedata* L., the all-lilac form has been known for more than a hundred years as *V. pedata*, while the bicolor form, which is the real species, has been regarded as the variety. The finest forms of the true *V. pedata* are found in the Alleghany Mountains of West Virginia and the Washington district, and it was from the latter that the Linnean species was described. From there it goes north, to a line drawn from Massachusetts to Minnesota, and was once common on Long Island until this became a summer appendage of New York. In nature it belongs to dry fields and open woods; in cultivation it is apparently difficult. Yet a bundle of dried-up roots came to me from the centre of the United States and after five weeks' journey were put in the ground with the faintest of hopes and bloomed profusely in full sun and light soil on the top of a mound, where no moisture can possibly collect—and this in sun-baked Kent. The normal flowering time is April–June; but *V. pedata* has the happy habit of putting up many flowers in late summer and autumn.

27. *Three Yellow American Violets*.—These are the 'Orbiculares,' and all beautiful. The name of the group is derived from the roundish, sometimes very round, deeply cordate leaves. They are stemless plants with more or less leafless stolons, yellow flowers with short spur, and club-shaped style with two-lobed stigma. In this and succeeding groups the presence of the two stigma lobes seems to indicate a tendency towards the next, or *Dischidium*, section. *V. sarmentosa* Dougl., known sometimes in catalogues as *V. sempervirens* Greene, has evergreen leathery leaves, and comes from dry open woods on Vancouver Island and thence south along the coast to California. *V. rotundifolia* Michx., with very round leaves, about 1 inch broad at flowering and later much broader, and the stems bearing only an occasional leaf, inhabits rich woodlands, especially beech woods, growing in rotten leaf-mould, along the Atlantic Basin from Maine to North Georgia, ascending to 4,500 feet in Virginia. The rarest and most beautiful of the three, with the flowers more golden yellow than the others, smaller leaves, and the racemes rather more leafy, is *V. orbiculata* Geyer, from dark woods of *Thuja gigantea* in Idaho north to British Columbia, in the last rising to 4,200 feet.

28. *Mexican Violets*.—The twelve Mexican Violets of the *Nomimum* section overstep Mexico proper into New Mexico on the northern side and into Columbia and Ecuador in South America. They are exclusively high mountain plants, ranging from 4,000 to 10,000 feet, and inhabit pine woods, alpine meadows, and grassy edges of tracks. In type of flower and habit of plant they have resemblances to *V. odorata*, but the flower is smaller. The colour is pale violet or white, or white with violet veins, or violet with white spur. They are stemless plants, with

stolons (but these are often underground or wanting), the leaves longly petioled, round or ovate and cordate, the roots densely fibred, the style bent at base, the stigma margined and with short beak. The most widespread are *V. humilis* H.B.K., *V. ciliata* Schlechtd., and *V. reptans* Robinson, the last two bearing resemblances to certain species of North America.

29. *V. umbraticola* H.B.K.—This is another woodland, high mountain Violet from Mexico, but is dissociated from any other group. Stemless, stolonless, very leafy, dwarf, not more than 3 inches high, the root nearly vertical, the leaves ovate-cuneate, the stipules dark and longly fimbriated, the style more or less club-shaped, the stigma papillous and very shortly beaked, *V. umbraticola* seems without connexions, but is perhaps most suitably included at the point where the Nomimium section begins to show certain characteristics of the Dischidium.

30. *V. arcuata* Blume.—Such characters are shown also by the Bilobatae, a group of about fourteen species, of which the principal is *V. arcuata*, known to a few catalogues as *V. distans* Wall., a plant of the highest mountains of Java, Sumatra, the Philippines, Ceylon, Burma, and South China. This group is stemless, with sometimes upright and non-rooting and sometimes decumbent and rooting stolons, longly petioled round and cordate leaves that have the basal lobes standing forward, small white or pale violet blooms, style curved at the base and clavate, and stigma lobed on both sides and beaked in front. *V. biflora*, of the Dischidium section, has no beak to the stigma; but several of the Bilobatae (such as *V. amurica* W. Bckr. from Manchuria, and *V. Caleyana* G. Don from Australia and Tasmania) were put as forms of *V. biflora* by Regel and other botanists. From Manchuria to Tasmania is a far cry, and the species of this group vary greatly in consequence. Some are very dwarf, with few or no stolons; another, *V. Raddeana* Regel, has the stolons over a yard long at fruiting time. The leaves vary from reniform to arrow-shaped, sometimes large, sometimes very small. They are mainly plants of marshes, damp meadows, and woods in the mountains, ascending to nearly 9,000 feet in the equatorial regions.

THE SECOND, OR DISCHIDIUM, SECTION.

The first section, or Nomimium, is, as has been seen, very large; the second, or Dischidium, is very small, comprising but nine species, of which the only one at all well known is *V. biflora* L. The Dischidium species are all stemmed; the stipules small and free; the basal leaves round; the flowers small, yellow, sometimes suffused with violet; the four upper petals are erect, and all are beardless; the stigma is two-lobed, with the orifice between the lobes, and never beaked. The Nomimium Violets, on the other hand, are stemmed or stemless or with stolons; the stipules are free or connate, small or large; the leaves round to lanceolate; the flowers usually blue,

sometimes white, rarely yellow ; the lateral petals directed sideways ; the stigma with frontal beak, and the style more or less curved and clavate.

31. *V. biflora* L.—*V. biflora* (figs. 86, 87) varies considerably in form and texture of leaf and in the pubescence of the plant as a whole. That it does not vary more is surprising in view not only of the altitudinal stretch it covers, from the sub-alps to 13,000 feet, but also of the vast extent of the Northern Hemisphere which it inhabits: nearly all Europe (but not in Britain); then reaching across Asia from the Caucasus through Turkestan and Siberia to Sakhalin and through Afghanistan and Tibet to China and Korea; and reappearing in Alaska and the Rockies of Colorado. Not only does it ascend to icy heights but also it reaches nearly to the Arctic Circle. In the European Alps the most beautiful plants are found in damp places at the foot of, or even underneath, rocks. The flower is small, yellow, becoming paler, with sometimes dark lines; the spur very short; the auricles rudimentary; the stem about 8 inches, with a single leaf in the middle of the stem; the stem bearing one to three flowers (in spite of the name); the basal leaves three or four, longly petioled and broad. I have not seen a good plant in cultivation. Recently *V. crassa* Mak. has found its way into lists: this is *V. biflora* var. *crassifolia* from Japan and Tibet. Of the other eight species of the section seven are Chinese and one belongs to Nepaul and Sikkim. They vary from the type in numerous ways: in being more robust; the flower larger; the colour yellow, tinted with violet, or all violet; the spur long; the leaves small, or ovate-lanceolate, or papery, or thicker in texture; the leaf-form triangular, or acuminate; the leaf violet beneath, or pale; and so forth. But it must be long before they can be brought into cultivation.

(To be continued.)

WALNUTS.

By H. SPENCE, M.I.Chem.E.

[Read November 19, 1929]

THE title of my talk is perhaps a little misleading—it should rather have read “The Walnut and Walnuts,” for my attachment is to the tree as a whole and not to its crop only. I apologize in advance for straying a little beyond the strictly horticultural boundary.

It is interesting sometimes to try to analyze how one becomes attracted to a particular genus or species or even variety, and, as a tree-lover always, the remarkable accounts of some walnut hybrids in California, many years ago, first gripped my imagination and left an interest which has since intensified and widened.

As befits the royal walnut, *Juglans regia*, its lineage is an ancient one, and walnut species have been recognized in very early geological times. They have been identified in Secondary Cretaceous deposits in Europe and America—an age even before the chalk hills of the North and South Downs were laid down—and numbers of species have been found in the later Tertiary deposits of Greenland and other parts of the world whence they later completely disappeared under changing climatic conditions. Their descendants, comprising at least a dozen well-marked species, are now found in both the old and new world and form some of the finest and most valuable hardwood trees. In addition to the English or Persian walnut, which is indigenous to South-Western Europe and extends through Asia Minor, Persia, and the Himalayas to the Pacific, the old-world species comprise two or three from Manchuria and Japan. The new world is richer with a number of so-called black walnuts, among which the North American black walnut forms magnificent forest trees—with a height of up to 150 feet. M. DODE, who has devoted especial study to the genus, divides the walnuts into a much greater number of species and sub-species than is general—some 44 in all. Those interested will find his descriptions in the Bulletins of the Dendrological Society of France of 1906 and 1909.

Before coming to the Persian walnut and its fruit, I would like to speak a little about walnut wood. To many people the wood of the walnut is one of the most—if not the most—beautiful in the world, and it has been held in high esteem since Roman times for its quality and appearance. The two walnuts that now count most for their wood are the Persian walnut of the old world and the black walnut (*J. nigra*) of the eastern states of North America in the new. With the non-warping and excellent working and lasting qualities possessed by both species, each has its own particular merits and advocates. Both

have the delightfully silky grain and soft warm look that so peculiarly fit them for domestic furniture woods, and both can show the wonderful mottled, rippled, and figured effects yielded by the root-stumps and crotches of well-grown trees and, above all, the gorgeous figuring of the burrs found, at their best, comparatively rarely in this country but more frequently on the Persian walnut in the Near East and lower Himalayas. The cause of burr formation is obscure: it has been attributed to various agencies, and this subject is one in which the East Malling Research Station is interested, and for the study of which some material has already been collected. Much the greater part of this highly figured wood is cut into veneer, and the beautiful mirror-image pattern effects in duplicate and quadruplicate so obtained are unexcelled in any known wood. Most walnut veneer is sliced rather than sawn and, after the wood has been softened sufficiently by hot water and steam, as many as thirty veneer slices to the inch may be cut from the solid. A visit to a large walnut veneer factory, with its 4- or 5-foot piles of almost paper-thickness veneer, in all their extraordinary variety and figure, is a delight. The Persian walnut has a lighter, more greyish-brown tone in comparison with the more chocolate and darker or even purplish-brown of the American black.

The non-warping character of walnut wood has long made it the favourite for gunstocks—a position it still holds despite many attempts to substitute cheaper material. The home-grown wood is harder and more durable than the foreign and is compact and easy to work. As probably most of you know, walnut was considered one of the finest timbers for aeroplane propellers in the early days of aviation.

Certain varieties of the Persian walnut in France, among which are 'Noix Anguleuse' and the 'Noix de la Saint Jean,' are reputed to give especially good black-veined timber. Another walnut, the North American butternut or white walnut (*J. cinerea*), is also used for furniture, but has not the same reputation. In South America the Bolivian black walnut, a very fine forest tree, gives a timber closely resembling the North American black.

The species of *Juglans* hybridize amongst themselves very readily, and chance hybrids between *J. regia* and *J. nigra* have long been recognized. In the eastern states of North America the butternut hybridizes so freely with any nearby Japanese walnut (*J. cordiformis* or *J. Sieboldiana*) that it is impossible to grow true seedlings of either in its vicinity. But to BURBANK in California must be given the credit of the first systematic experimentation on walnut crosses. Under Californian conditions the hybrids he produced between the Persian walnut and the native black Californian walnut, and between the latter and its eastern neighbour, *J. nigra*, showed in an unusual degree the growth vigour known frequently to be found in first crosses. Unfortunately much of BURBANK'S work has been discredited both by the typical American press-boosting it received and by claims of closer scientific control than could be substantiated. The fact remains that BURBANK had a marvellous flair for selection,

even at the earliest stages of growth, amongst the positively innumerable seedlings and crosses and re-crosses he raised, which enabled him, time and again, to arrive at the desired combination of characters in the shortest of time. His work on walnut hybrids was examined by DE VRIES, and some idea of their character under Californian conditions may be gathered by the following extract from his work on "Plant-breeding":—

"In the year 1891 BURBANK crossed the English walnut and the Californian black walnut and afterwards planted a row of them along the road before his residence. At the time of my first visit six gigantic trees were seen growing. They had reached twice the height and size of ordinary walnut trees. Three of them he has since been compelled to cut down, because they increased too rapidly. This summer (1906 *) I saw the three remaining specimens, 80 feet in height and 2 feet in diameter. He showed me sections of the cut stems. Their wood was of a fine grain, very compact and of silky appearance. The annual layers measured about 5 cm. (1.96 inch), a most extraordinary thickness. Fast-growing trees are usually of soft grain, but these hybrid walnuts have a wood as hard as that of the ordinary species."

I would like to quote from Professor AUGUSTINE HENRY's article on the artificial production of vigorous trees in relation to ring-porous and diffuse-porous woods. He writes :

"It is a popular belief that fast-growing timber is necessarily soft and comparatively worthless. This is a fact in most conifers ; but in one class of broad-leaf trees, the wood of which is characterized by large pores in the inner part of the annual ring, the contrary is true, as the faster the timber of these trees is grown the stronger and denser it becomes. This class includes oak, ash, chestnut, hickory, and walnut, the species in fact that *par excellence* produce the most valuable timber."

The importance of these facts can hardly be over-emphasized.

Professor HENRY gives another example of the cross between the Persian walnut and the American black which, though less than 40 years old, was found by the U.S. Department of Agriculture to be 99½ feet high with trunk girth of 15 feet 4 inches, at a height of 4 feet from the ground. Scions are now under propagation at East Malling from two 'Paradox' trees (the name under which hybrids between the Persian and either the eastern or western American black walnuts are known), one 20 years old with a spread of 75 feet and a diameter of 2 feet at 24 inches, and a second, 55 years old, 65 feet in height, 135 feet spread, and 5 feet 4 inches diameter at 18 inches, and 6 feet 1 inch at 5 feet in height, where it bifurcates into two limbs of 4 feet 2 inches and 3 feet 7 inches diameter, which again branch into six limbs averaging 18 inches diameter. Probably the largest walnut tree in the world, with a height of 100 feet, a spread of 134 feet, and a circumference of 31 feet 3 inches at 4 feet above ground, but

* *i.e.* 15 years after planting out.

narrowing rapidly to somewhat over 25 feet at 6 feet in height, was growing in Virginia until about a year ago when, most unfortunately, it was cut down by the owner. It is believed to have been a hybrid between *J. regia* and *J. nigra* (or, possibly, *J. cinerea*). The actual figures cited have all been obtained under American conditions, but while full allowance must be made for their especially favourable environment, the possibilities open for the selection of exceptionally vigorous first or second generation hybrids responding favourably to other climatic conditions are great, and the material available for experimentation is ample. The choice is not always limited to the first cross, indeed in the case of the so-called 'Royal' walnut hybrid—that is, the cross between the eastern and western species of the American black walnuts—it is frequently among the F₂, or second generation, seedlings that an almost bewildering choice of material may be made. From seed from one of BURBANK'S 'Royal' hybrids I obtained an extraordinarily wide variation of type differing in habit, in leaf, and in vigour of growth ranging, at the end of 5 years, from dwarfs 5 or 6 inches in height to stout trees of about 9 feet. The fusion of the fixed parental types releases for one or at the most two generations, the accumulated latent characters of their ancient ancestry. What has hitherto been lacking is a method applicable as in the case of the easily propagated poplars, elms, planes, and the like, to the much more difficultly propagated *Juglans* hybrids and species—by which the finest individuals may be perpetuated with certainty as clone stocks. In this direction the East Malling Research Station has already succeeded with a considerable number of species and hybrids of this genus (see p. 257).

Systematic experimentation on tree breeding for the production of timber should be an integral part of State afforestation work in this country. The earliest of its kind, the Eddy Tree Breeding Experiment Station, has recently been established in California, and walnut hybrids are among the first upon which attention has been concentrated. Growth-vigour is a character peculiarly subject to conditions of environment—hence the necessity for a similar establishment here to breed the hybrids and find the varieties which best respond to our particular conditions—and to improve methods of propagation to make forestry as exact a science as horticulture.

But our special subject is the English or Persian walnut—not indeed indigenous to these islands, but its introduction probably dating back to Roman times. It is as much at home here as anywhere in the world. Some particularly fine trees occurring in Scotland are described in the *Transactions of the Highland and Agricultural Society of Scotland* of 1884. I could wish the grey corded bark with its deep, almost parallel fissures and the delightfully scented foliage of the tree were a more familiar part of the landscape. And lest its peculiar virtues and merits have escaped the notice of some of my audience, let me enumerate a few, at least, on no less an authority than EVELYN.

"Besides the uses of the wood, the fruit with husk and all, when

tender and very young is for preserves (condited in separate decoctions, by our curious ladies) also for food and oyl; of extraordinary use with the painter, in whites, and other delicate colours. . . . For food they fry with it in some places, and eat it instead of butter in Berry, where they have little or none good; and therefore they plant infinite numbers all over that country. The younger timber is held to make the better work but the older more firm and close, is finer chambleted for ornament [a delightful old English word, by the way, for its silky ripple] and the very husks and leaves being macerated in warm water, and that liquor poured on the carpet of walks . . . does infallibly kill the worms without endangering the grass: Not to mention the dye which is made of this lixive, to colour wool, woods, and hair, as of old they us'd it. The water of the husks is sovereign against all pestilential infections, and that of the leaves to mundifie and heal inveterate ulcers."

Before coming to the subject of walnuts at home, a brief study of walnuts abroad may be very helpful, and particularly their cultivation in France and California. In the latter country commercial walnut cultivation is of comparatively recent growth. Introduced by the Franciscan Missions about the middle of the eighteenth century, it was only towards the latter part of the last century that walnut growing seriously expanded. The parentage was largely of Chilean, and therefore Spanish, origin augmented later by importations from France of both scions and trees. At that time the vast majority of the trees were seedlings, but by the beginning of the present century recognition of the necessity for growing selected varieties by budding and grafting was general, and no seedlings are now planted commercially. The crop has gradually risen from about 2,000 tons in 1889 to as high as 43,000 tons in 1927, with an area of about 130,000 acres wholly devoted to walnuts. There are considerable variations in the crop from year to year. The types selected for propagation from among the enormous number of seedlings available include some of the finest walnuts grown and the introduced French varieties have given rise to local varieties of especially good quality. The trees are mostly grafted or budded on to seedling stocks of the northern Californian black walnut, although the eastern black and the Persian walnut are also used. Hybrid stocks, the 'Royal' and 'Paradox,' have also been employed and exert a marked effect on scion growth vigour in early years. The trees are planted 50-60 feet or more apart, and clean cultivation, and also the use of winter leguminous cover crops, planted after harvesting and ploughed in during the spring, is general. Systematic irrigation is necessary in many parts of the State. A yield of about 500 lb. an acre for trees between 7 and 12 years old may be expected. From full-grown carefully tended groves, crops of up to 2,000 lb. an acre are obtainable, but the general average is rather less than half this figure. As here, the crop ripens from the latter part of September to well into November. After collection the nuts are first dried either in trays



FIG. 89.—IRRIGATING A WALNUT GROVE IN CALIFORNIA.

[To face p. 248.]

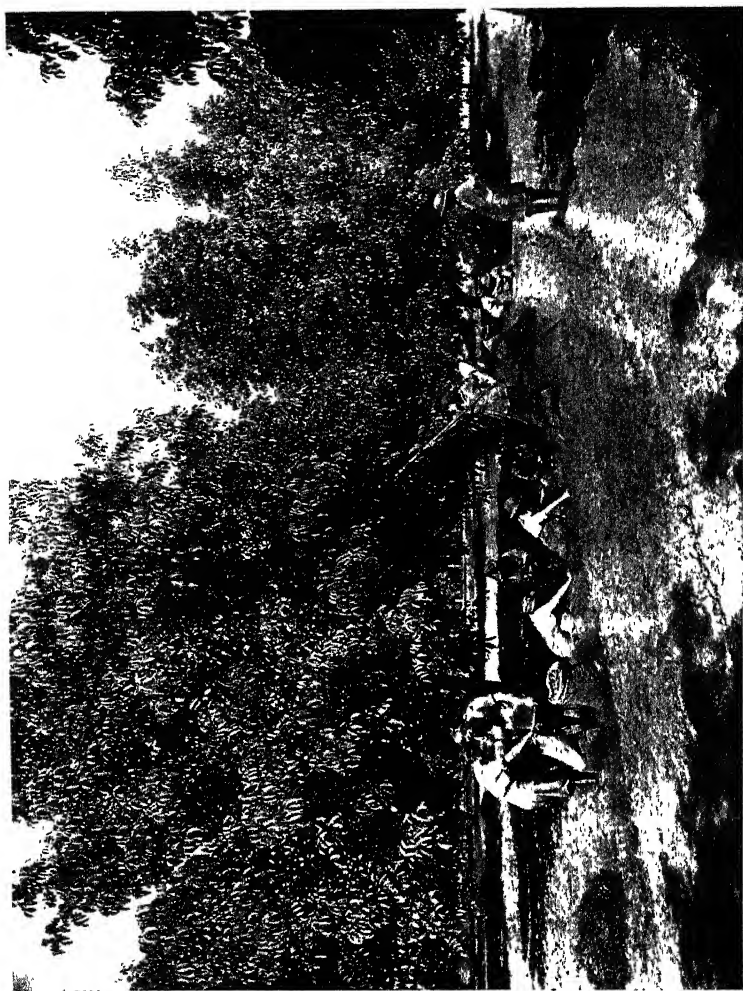


FIG. 90.—HARVESTING WALNUTS IN CALIFORNIA

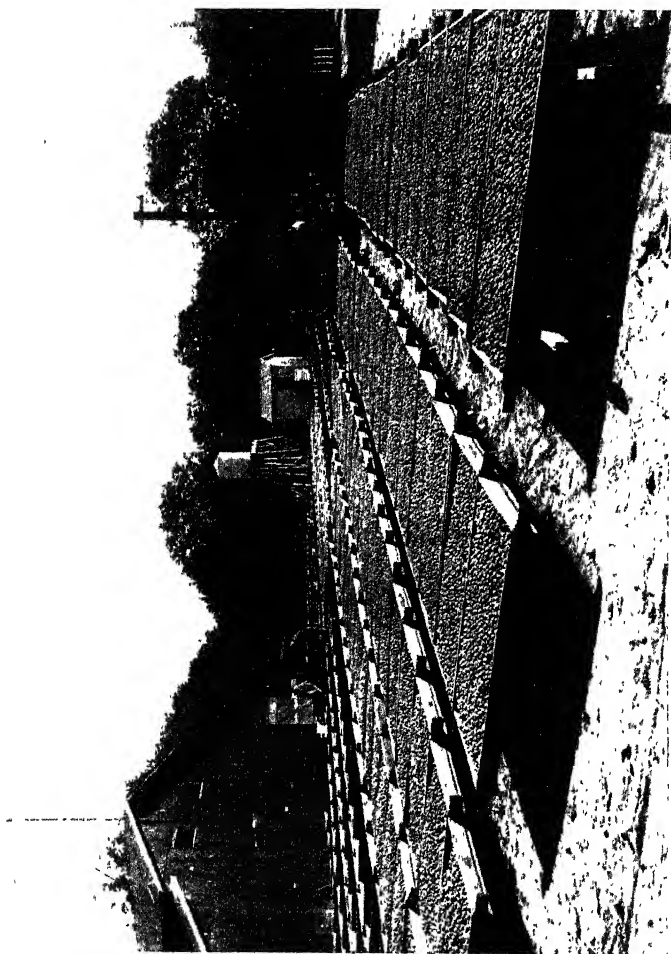


FIG. 91.—SUN-DRYING WALNUTS IN CALIFORNIA.

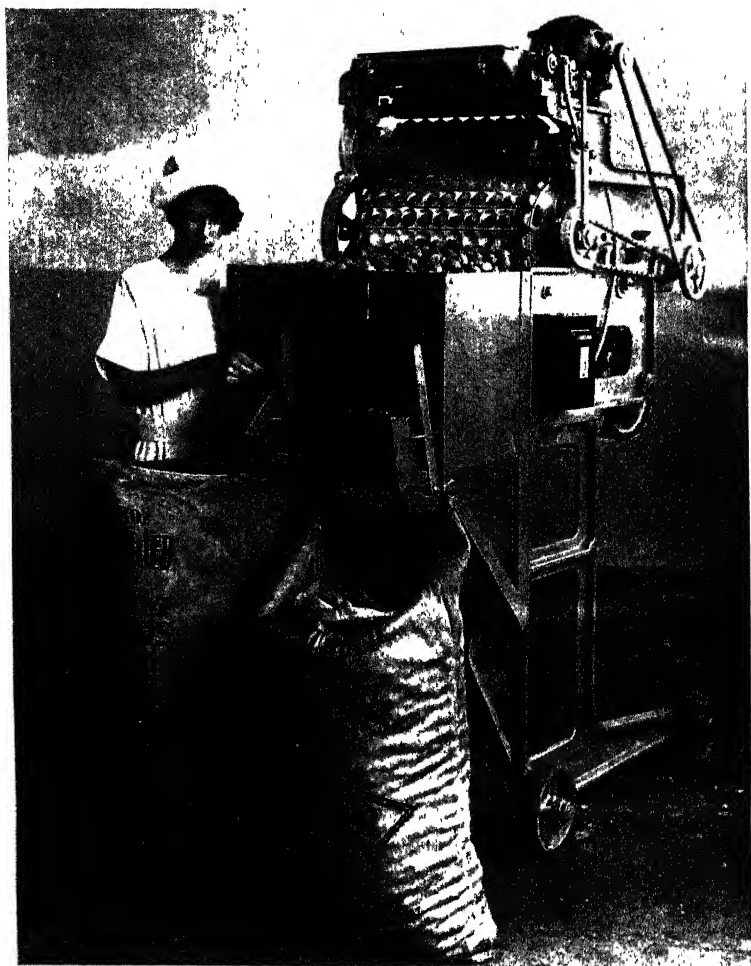


FIG. 92.—BRANDING MACHINE USED BY THE CALIFORNIA WALNUT
GROWERS' ASSOCIATION.

About 500,000 nuts are branded in an hour.

[To face p. 249.

in the open or in dehydrating machines in a current of warm air. They are then usually taken to a central collecting station, where they are finally prepared for the market. The light-weight nuts are removed by a suction machine, followed by hand-grading while passing over travelling conveyers. After bleaching in a rotating cylinder by a spray of electrolytically prepared sodium hypochlorite solution in quantity sufficient to wet the shell, the nuts are mechanically graded for size in a rotating cylinder with varying sized perforations along its length—then submitted to a second hand-grading on conveyer belts and thereafter dried in large bins by means of hot air, at a temperature not exceeding 110° F. The moisture remaining is only about 6 per cent. The final stage with the walnuts produced by the associated growers is to brand their highest-grade nuts; the machine employed brands rather over 2,000 walnuts a minute.

The quality of the commercial Californian walnut is very high. Some of the well-known varieties are sold under their individual names, the general crop coming under classification by size and grade. The average weight varies between 11 and 14.5 grams or, say, 40–32 to the lb. The percentage of kernel is 45–50 and the flavour and degree of freedom from astringency is very good.

The most serious trouble of the walnut grower in California is walnut blight or bacteriosis, caused by *Pseudomonas juglandis*. This bacterial disease causes very considerable crop losses in certain years. It has a superficial resemblance to the fungus disease known as Anthracnose in France (*Marssonina juglandis*). This is probably familiar to most of you in the black spots frequently to be seen on the young green walnuts sold for pickling purposes. In its most serious form bacteriosis affects the young growth in the earlier months and its presence is shown by black sunken spots. Some twigs are killed back from the tips, but the disease is checked as the growth becomes more woody and the parts affected tend to heal. Many small nuts attacked drop when about $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter, or may show the characteristic black spots without further injury. No practicable method of controlling the disease has yet been devised, and the tendency is towards the selection or breeding of resistant types, the cultivated varieties differing considerably in susceptibility. The disease is not fatal to the trees. Other pests affecting walnut cultivation in California are codling moth and aphid. The cost of spraying walnut trees of full growth would almost be prohibitive, but effective control may be secured by the use of suitable dusts such as those containing nicotine and arsenate of lead. These dusts are applied in still moist air, preferably in the early hours of the day.

The Californian walnut industry affords an interesting example of the application of scientific methods of cultivation and of modern methods of handling a fruit crop which lends itself peculiarly to mechanical treatment, but a study of French walnut culture has, I think, much more direct interest to us in its greater applicability to

our conditions. Despite the fact that France can show no great areas devoted wholly to walnut cultivation, her annual production is still much in excess of that of California: in the ten years immediately preceding the war the yearly crop averaged between 55,000 and 60,000 tons. This is not to say that walnut orchards of some size are not to be found in France—the contrary is the case in certain Departments, notably in the Isère Valley and in Dordogne, but undoubtedly the main French crop is derived from the innumerable single or grouped trees cultivated so generally over large areas of the country and which are to be found scattered throughout the vineyards, wheat-fields, the beet and tobacco fields, along the borders and in the grasslands. This has been the custom for many centuries, and I would like again to quote a pertinent sentence from EVELYN who wrote in 1664:

“This Burgundy abounds with them, where they stand in the midst of goodly wheat-fields, at sixty, and an hundred foot distance; and it is so far from hurting the crop, that they look upon them as a great preserver, by keeping the ground warm; nor do the roots hinder the plow. Whenever they fell a tree (which is only the old and decayed) they always plant a young one near him, and in several places twixt Hanau and Frankfort in Germany, no young farmer whatsoever is permitted to marry a wife till he bring proof that he hath planted and is a father to such a stated number of walnut trees, as the law is inviolably observed to this day, for the extraordinary benefit which this tree affords the inhabitants.”

How closely these conditions still hold may be seen in the accompanying photographs (figs. 93, 94). Dr. BATCHELOR of the University of California College of Agriculture, who has studied the European walnut-growing countries very closely, and to whom I am indebted for material for the slides and for much information on French walnut culture, likens the distribution of walnuts in central France to that of elm trees in his own eastern and central states. As in California nowadays, commercial cultivation is based on grafted trees, although very many seedling trees are still to be found. Until comparatively recently the general practice was to grow seedling Persian walnuts in the permanent site, and these were allowed to grow to a considerable size before grafting over to the desired variety, usually at from three to five years old. The trees are headed very high: this is to be expected where the walnuts are regarded as an upper-storey crop and with a view to the minimum interference with arable cropping below. Under these conditions bearing is longer delayed than when grafted nursery trees are planted out, and the use of the latter is increasing. The American black walnut and also the Californian black are now used to an increasing extent as stocks, as they are more resistant than the Persian to *Armillaria* or oak-root fungus. A recent investigation appears to show that the presence of sufficient lime in the soil is the best safeguard against this disease—which in France is a more serious enemy to the walnut than blight. The injury is due to the penetration

of the roots by the mycelium of *Armillaria mellea*, and the death of the tree may follow in from three to eight years.

The harvesting of the crop, as might be expected, is mainly a family affair. On ripening, the green pericarp of the nut usually splits open on the trees and breaks away on falling to the ground. The nut should be removed as soon as possible from contact with the husk (including the fibrous husk lining which tends to adhere to the shell), as otherwise this may cause serious discoloration and favour the later development of mould. Daily collection, preferably after the morning moisture has dried off, is accordingly recommended. When the number of nuts falling indicates that most of the crop is ripe, many of the remaining walnuts may be shaken down by the aid of long poles ending in a cloth- or rubber-covered hook. They frequently require cleaning and are washed for three or four minutes at the most in tubs (fig. 95) or otherwise, or sprayed in a revolving cylinder. After draining, the walnuts are usually bleached and the old method of achieving this by means of burning sulphur fumes is still largely employed. The nuts must then be dried, and this process is carried out in all sorts of different ways suitable to the scale of operation. Upper-storey curing lofts, with a slatted floor on which the nuts are laid to a depth of 4 to 6 inches, and built to obtain the maximum exposure to wind and sun, are most commonly employed—the nuts being regularly turned over with rakes. Under these conditions, and especially when the nuts have been washed, the drying operation takes three or four weeks. This time may be materially shortened under the best conditions of ventilation and exposure. The use of artificial drying by means of heated air is finding favour in some districts, particularly as a preliminary treatment for about 12 hours to remove a good deal of the original high proportion of water and get over the critical mould development stage, followed by ordinary temperature curing for about half the usual time. Prepared by the comparatively simple methods available to the general farmer, French walnuts are produced of a quality equal, at their best, to the finest grown.

In a country so richly endowed with walnut trees the preparation and sale of their valuable timber has considerable importance. A Grenoble walnut timber yard, for instance—in a district which, compared with others, is a relatively small producer of walnuts—shows something of the importance of this aspect of walnut growing. All of us, I think, would regret the conversion of the trees of our wonderful countryside and hedgerows to the strictly utilitarian character of so much of the timber to be seen on a continental journey, but, without abating one iota of their charm and delight, how many of the practically valueless elms, sycamore, and others, bordering on arable fields and grasslands, might be replaced by walnut with the prospect of profitable crops in good years and an annual increment in timber value? Our forefathers valued their walnut trees more highly than we, and a list of those cultivated at the Chiswick Gardens of the Horticultural Society of London at the beginning of last century

includes ten varieties, and an early volume of *Transactions* describes one especially good walnut cultivated in Thetford. Although THOMAS ANDREW KNIGHT nearly one hundred years ago described methods of both grafting and budding the walnut, the operation in the open under ordinary conditions is a difficult and uncertain one in northern countries, and the result has been that almost without exception the very large number of walnuts up and down the country are seedlings—with the natural corollary that every tree differs more or less from its neighbours and the vast majority are of very poor quality. About five or six years ago I had the gratification of interesting Mr. HATTON, the Director of the East Malling Research Station, and Mr. H. V. TAYLOR, Commissioner for Horticulture, Ministry of Agriculture, in the question of the improvement of walnut culture in this country. It was realized that very little definite information was available and that systematic investigation into the problems of the crop generally was essential, coupled with an effort to locate the best trees with a view to their propagation and distribution. The nucleus of a collection of grafted trees of the best varieties from France and California was at once formed at East Malling, and subsequent additions now afford considerable experimental material for acclimatization trials and for the propagation of those found to be the most adaptable to our conditions. In addition to well-known and named commercial varieties we have obtained, through the Horticultural Division of the Ministry, scions from such countries as Cyprus and Persia, after having examined and tested nuts from some particular tree of high local reputation from which the scions were afterwards taken, and have also grown a number of seedlings from the best foreign nuts with a view to later selection and propagation if any trees of merit are found among them. The Research Station at East Malling undertook a close study of the best means of readily propagating, under our difficult climatic conditions, any home or foreign variety of merit—concurrently with research on rootstocks and their standardization. Very substantial advance has already been made in these and other directions, and methods are already available of raising any varieties required under commercial conditions. A very interesting paper on this subject by Mr. A. W. WIRT, East Malling's able and enthusiastic propagator, will be found in Supplement II to the Station's Report for the years 1926-7 (see also p. 257). In the course of the walnut survey during the past five or six years several hundred samples of walnuts from trees in the central and southern counties have been collected by the Ministry's Inspectorate Staff and others and forwarded to me for investigation—to which another three hundred odd from the present competition must be added. Their examination and the study of the data relating to the parent trees supplied at the same time have brought to light interesting and helpful facts. In the first place English walnuts bear excellent crops—none better. Although the competition entries include nuts from quite a large number of trees with small crops the average of

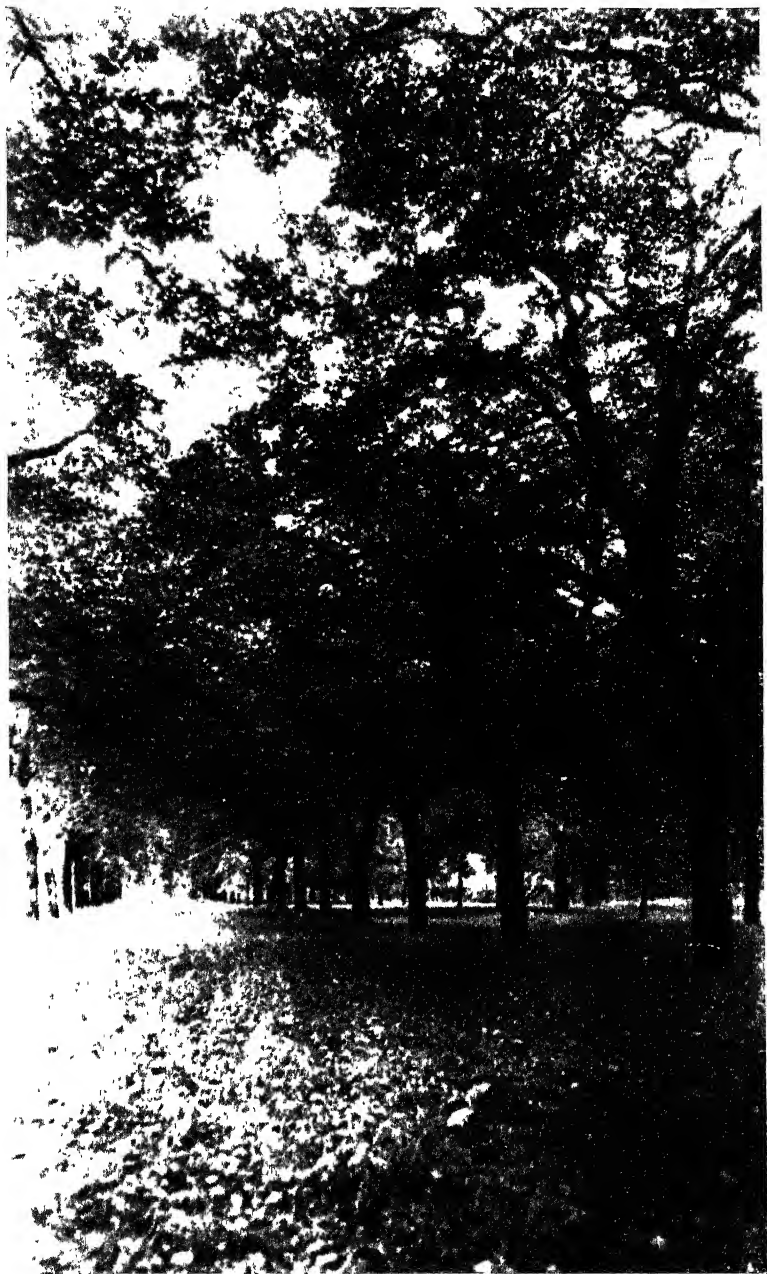


FIG. 93.—AN 80-YEAR-OLD GROVE OF WALNUTS IN FULL BEARING
NEAR GRENOBLE.

[To face p. 252.]



FIG. 94.—GENERAL FARMING NEAR LA BACHELLERIE WITH WALNUTS AS AN IMPORTANT SECONDARY CROP.

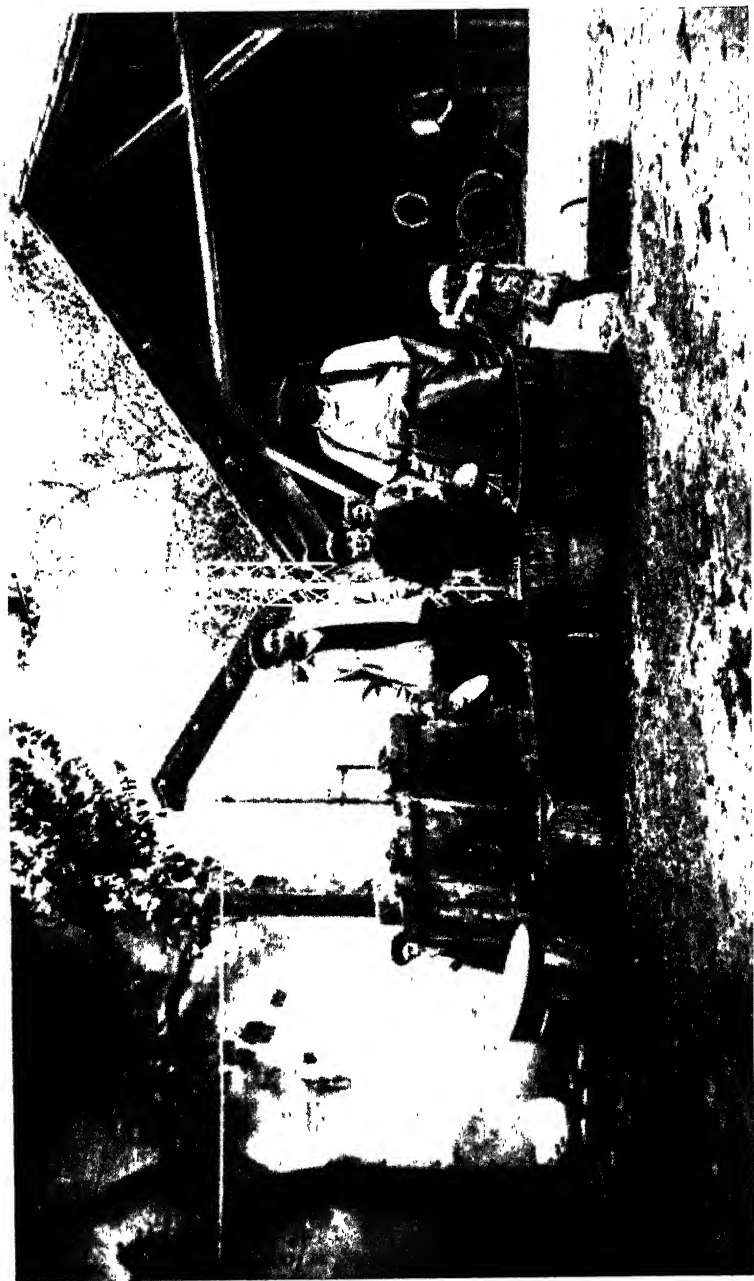


FIG. 95.—ONE METHOD OF WASHING MAYETTE NUTS.
The nuts are churned in a tub and lifted out with a strainer.



FIG. 96.—A FINE WALNUT IN THE COTSWOLDS.
Spread 75 feet.

To face p. 253.

Class I was over $1\frac{1}{2}$ cwt. a tree. Yields of up to 10 cwt. of nuts weighed as gathered (and free from husk) are not infrequent and in some cases even more. A crop of 54 bushels was gathered from a fine tree in the Thames Valley in 1927. Our work would be unnecessary if the quality were at all commensurate, but this, unfortunately, is not the case. The great majority of English walnuts suffer from two defects: insufficient development of the normal oil content of the nut and excessive moisture in the kernel. Not only do they shrink badly on drying, but they frequently develop a definitely woody flavour.

What are the points that go to make a good walnut? First and foremost it must possess the rich, mild, sweet (not sugary) flavour of the best French varieties, such as the 'Franquette' and 'Mayette.' Size, weight, colour, contour, thickness of shell, sealing and percentage and colour of kernel, are all factors to be considered and require brief comment.

Size is not of the first importance, and it is well known in all walnut-growing countries that the variety known as *J. regia maxima*, or locally in this country as the bannut or double walnut, while it produces extraordinarily large nuts, in some cases as few as 11 or 12 to the lb., is one of the poorest nuts grown. At times it makes a most attractive-looking crop and, in nine cases out of ten, will sell for twice the price of walnuts of much superior quality, but, with comparatively rare exception, it is most deceptive. It is usually excessively moist, ill-filled, watery in flavour, frequently astringent, and the kernel shrivels on moderate drying. Nuts 35 to 45 to the lb. are quite large enough. Good colour is obtainable with nearly all walnuts and its maintenance is dependent on frequent collection of the fallen nuts, separating them from the husk as soon as possible and hastening the elimination of the excess moisture by spreading out for a time in as warm a situation as practicable with plenty of ventilation. Sufficient thickness of shell and reasonably good sealing of the nuts is usually present except in very wet seasons, when malformation and, in some cases, perforation of the shell are common. It will probably have been observed by most walnut growers that this year—a year of unusually long hot spells in early summer—the shells of all walnuts are very much thicker and better sealed than usual and cracking in some cases has been difficult; the size of the walnut is fixed by July. A good ordinary French or English walnut requires a crushing stress of 30–45 lb., and it is not generally realized in cracking a walnut that power equivalent to this weight is exerted by the hand. Quite a number of the bannut variety have this year required a crushing stress of 80–90 lb.

But after all, the kernel of the nut is the important factor; this should practically fill the shell and represent not less than 40–50 per cent. of the total weight, either as freshly gathered or after drying. Its colour should be a light tan or silvery brown or straw, and the thin skin or pellicle covering the kernel (the four lobes of which, by

the way, are simply the two cotyledons of the seed, which do not emerge from the shell on germination) should be practically free from astringency.

A connoisseur of walnuts may ask, Why concern yourself with this, as they are usually peeled before eating? True enough, with fresh undried walnuts, but the object of our inquiry is the production of walnuts which, as in France and elsewhere, are capable of being dried and remaining palatable when eaten thus and unpeeled, and the best nut in all respects in the milky condition will be the best on drying. I have mentioned that one of the principal defects in most English-grown walnuts is insufficient oil development on ripening. In the course of the investigation this point has been somewhat closely studied, as it was early realized that improvement in this respect was essential; kernel quality in both fresh and dried condition is mainly dependent on its richness. An ordinary good-quality dry walnut with about 6 per cent. moisture should contain fully 55-60 per cent. oil. Various analyses made of English-grown walnuts have shown percentages ranging from 8 (a bannut by the way) up to the full 60 or more of the best-quality nuts. The season undoubtedly has a most important bearing on the question. We are on the borderline of a walnut climate and there is no doubt that the degree of summer heat and its duration have a marked effect on the proper maturing of our walnuts. It is equally certain that some trees are much more able to withstand adverse conditions than others, and one of our principal objects is to find, or introduce, varieties which despite the vagaries of our seasons may be depended upon to give a good performance, and to determine what soil and other conditions are most favourable. Information about any walnut tree of exceptional merit will be welcomed.

I would be glad if it were possible to speak more helpfully at this stage on some of the difficulties which meet the walnut grower. Disease need not, I think, be greatly feared, and under our conditions Anthracnose does not appear to be a serious factor. Some trees suffer from off years, but the proportion of trees reported in the competition as bearing annual crops to those bearing biennially is approximately four to one. The subject of pollination is undergoing study: all that can be said at the moment is the fact that the ripening of the stigmas sometimes is ahead and sometimes behind that of the anthers (the pollen is wind-carried and cross-fertilization may take place across a distance of as much as 500 or 600 feet) may be a contributory cause to poor cropping, but meantime a safeguard is—where you think of planting one walnut, plant two. Young walnut trees frequently bear female flowers only, but it has been observed at East Malling that certain varieties bear large numbers of the male catkins. Either interplanting an occasional fertile catkin bearer among other young walnuts or grafting one or two branches with this type would meet the difficulty. Many trees lose a crop owing to frost damage in the spring: in our trials we have several

late-flowering varieties, such as 'Franquette' and 'Mayette,' under test to meet this risk so far as possible. If your soil does not contain plenty of lime it should be added; dig in all your garden rubbish, and especially wood ashes, under the outer branches. A walnut crop is not very exhaustive of the soil, but after cropping for one or two hundred years something should be put back. Need I add that systematic irrigation is *not* necessary in this country! The problem of improving the methods now used to keep walnuts fresh and unmoulded over the winter months is under investigation at East Malling, and the French method of a preliminary drying at a temperature not exceeding 100° F. to remove a good deal of the original moisture might be adopted where circumstances allow. One simple and quite promising method which Mr. TAYLOR has suggested is lightly to dust the nuts (not too damp, by the way) with flowers of sulphur and then box in sand that will just not hold together on being squeezed.

Do not hesitate to plant a few of the best nuts or young trees this autumn—by the time they are grown sufficiently East Malling will probably be able to recommend scions with which they may be grafted. Do not worry whether they will bear fully in your time—your children and theirs will bless you.

The task of adjudicating on the walnuts entered for the competition has not been an easy one. Each sample had to be tested for weight and percentage of kernel as received and after drying, and about one pound of the nuts passed through graduated perforations to obtain an accurate measure of size; they have been tested for adequacy of sealing and examined for colour, contour, and the other relevant points. Most onerous of all, every one had to be tested for flavour.

Walnuts from 281 trees were received in Class I in which the nuts were evaluated as received, in the fresh milky state, *i.e.* the condition in which they are normally sold. In Class II 197 samples were received, the nuts in this case being judged in the practically dry condition as obtained by standing for a fortnight freely exposed to a temperature of about 60° F. The total moisture then averaged about 12–15 per cent. This is less dry than in commercial Californian nuts, in which the moisture does not exceed about 6 per cent. Of the nuts received in Class I 168 were also entered in Class II. A large number of entrants, especially in Class I, belonged to the sub-species *J. regia maxima* or bannut, and the quality was not infrequently distinctly above the average for this usually poor type of walnut. The result of the competition was especially gratifying in the comparatively large number of walnuts that possessed sufficient quality and oil content to come through the drying test with considerable success. Over thirty were selected as showing distinct merit in this respect. Their flavour, percentage of kernel, and other desirable qualities showed a marked improvement upon the general run and go far to prove that, in a good year, walnuts can be grown in this country which if not yet of quality equal to French nuts are not far behind. Several small nuts

showed up well, and while not in the running for a walnut for sale were good nuts for home consumption. It was impossible in the short time available between the receipt of so large a number of nuts for examination and the date of the competition to complete all the tests desirable before deciding upon the question of their value for propagation, and further analytical tests for oil percentage, etc., were subsequently undertaken. After some difficulty in differentiating between a considerable number showing distinct merit six have been selected for propagation and for further test and study. One in particular combines in an unusual degree the merits of especially good appearance and very fair quality, and we may, I think, congratulate our Society upon a very successful effort to bring to light a number of home-grown walnuts of distinct promise.

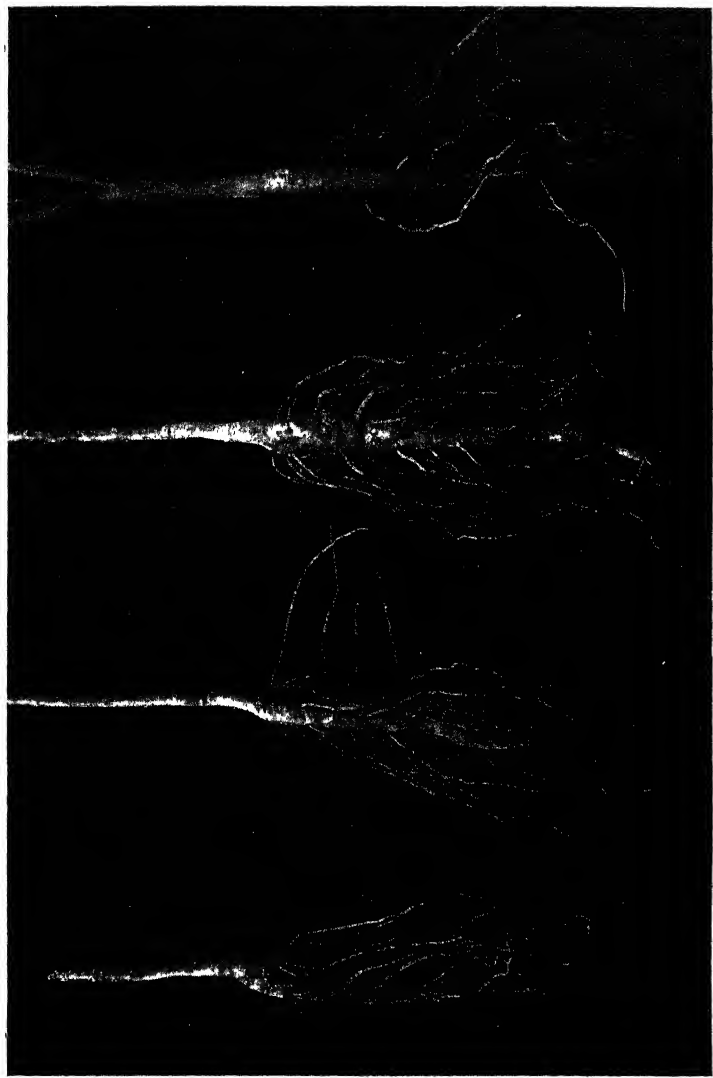


FIG. 97.—J. REGIA VAR. PRAEFATURIENS, J. NIGRA, J. REGIA, J. CALIFORNICA (TWO YEARS OLD).
L. to R. One-year seedlings.

[To face p. 250.]

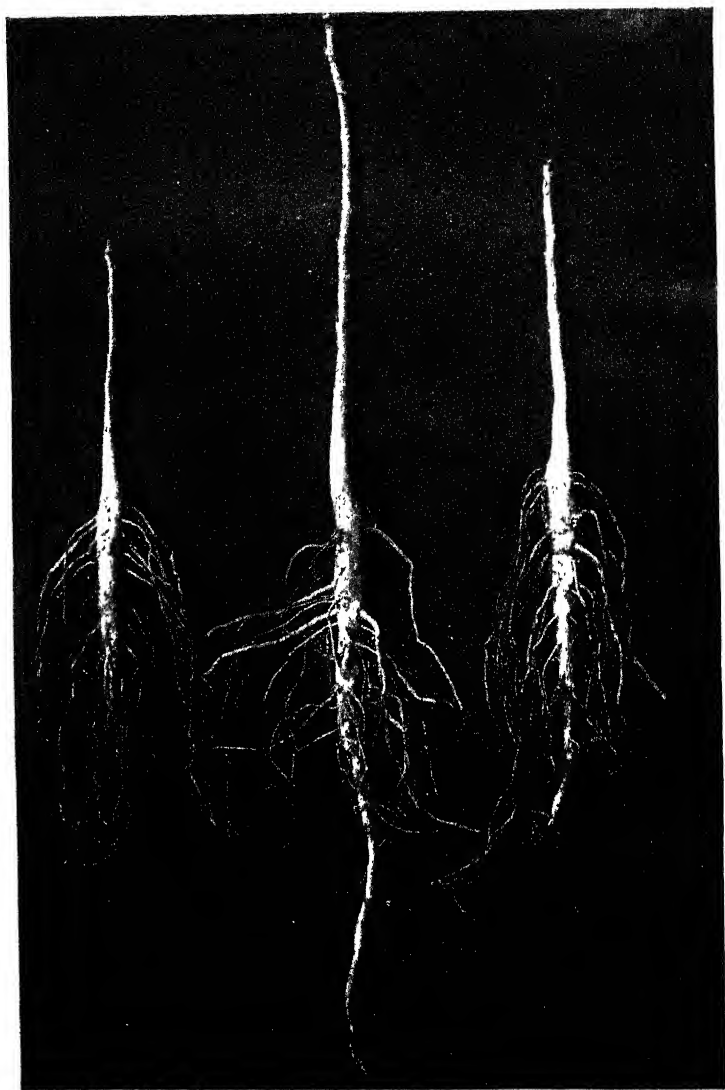


FIG. 98.—*J. NIGRA*, SHOWING VARIATION IN VIGOUR AND ROOT TYPE
One-year seedlings.



FIG. 99.—TWO DIFFERENT TYPES OF ROOT IN GREENWOOD CUTTINGS OF
J. REGIA.

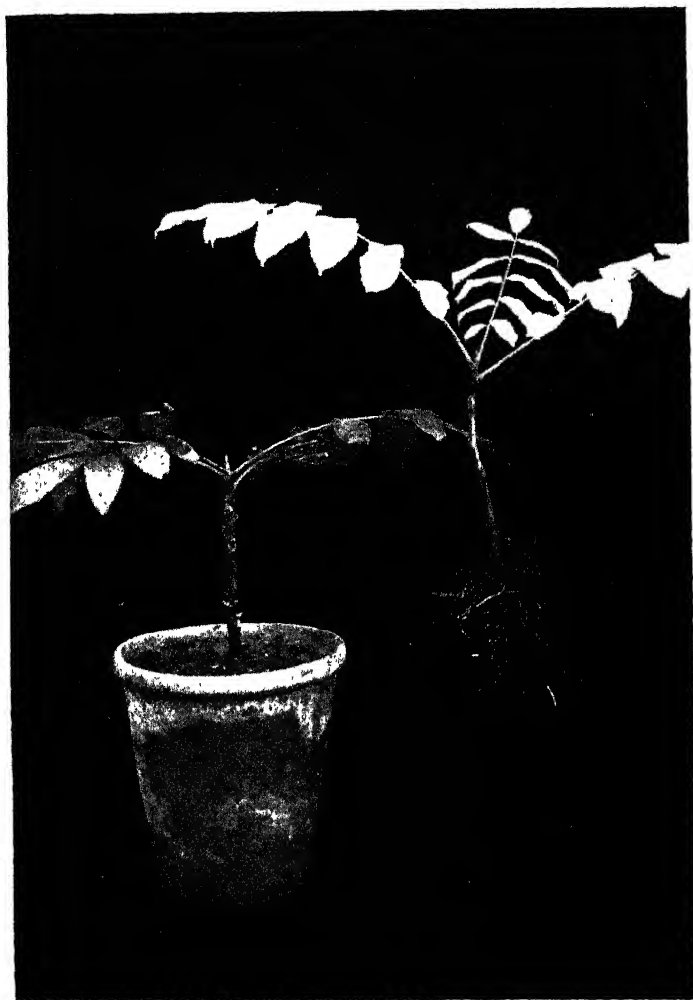


FIG. 100.—RAPID MULTIPLICATION. *J. CORDIFORMIS*.
Showing seedling nut grafted in pot, with rooted top on right.

FURTHER OBSERVATIONS ON WALNUT GROWING
IN ENGLAND.

By A. W. WITT, N.D.H., East Malling.

It is fairly safe to assume that well over 99 per cent. of the walnut trees at present growing in England are seedling trees.

Seedling walnuts, like other seedling fruit trees, show very considerable variation in productivity, quality, and size of the nuts. These seedlings are often many years before they produce a crop, and since it is not possible to predict their ultimate value, walnut growing on present lines is hardly an economic proposition.

At the Walnut Competition held in the Royal Horticultural Hall on November 19, 1929, some 470 separate dishes of walnuts, representing 314 different trees, were staged. A very small percentage attained a satisfactory standard of quality, size, contour, etc. Since, after the initial outlay, it costs no more to grow grafted trees from parents of high potential productivity, quality, etc., which can be reproduced true to type indefinitely, it is obviously uneconomic to plant seedling walnut trees the cropping qualities of which are very uncertain.

Named varieties of known good cropping and quality suited to English climatic conditions should be standardized by vegetative propagation. Such trees are capable of producing nuts at quite an early age, provided that suitable pollen is available on the same or adjacent trees to fertilize the potential nutlets.

METHODS OF PROPAGATION.

(a) *Stocks*.

At present seedling stocks are universally used. The chief species in use are *Juglans regia*, *J. nigra*, and in Western North America *J. californica* var. *Hindsii* and occasionally the hybrids 'Paradox' (*J. nigra* or *J. californica* \times *J. regia*) and 'Royal' (*J. nigra* \times *J. californica*). The last two stocks are reputed to make more vigorous trees of the scion varieties grafted upon them, and to be very desirable stocks if they could always be depended on to come true to type. However, since nuts are open-pollinated, possibly by various parents, in differing seasons, the resulting seedling plants vary in vigour and other characters from year to year and so cannot be depended upon.

At East Malling other seedling stocks have been tested, i.e. *J. regia* from the lower Himalayas which has pinkish leaves and very red petioles (this type conforms most closely to *J. kamaonia* Dode) and is a very fast grower, but the wood is somewhat soft, at least when young. *J. regia* var. *praeparturiens* is also being tested to see whether

its natural dwarf growth and precocity in fruiting can be imparted to the scion variety grafted thereon. *J. californica*, *J. cinerea*, *J. Sieboldiana*, and *J. cordiformis* are also being tried. The trees are, as yet, too young to give definite indications of their ultimate performance. At present, in the nursery stages, *J. nigra* and the common English walnut appear preferable. In America, according to BATCHELOR [1] the last named is now apparently again coming into favour, despite the greater resistance of *J. nigra* to oak-root fungus.

(b) *Method of Raising Seedling Stocks.*

Source of seed: *J. regia*. Walnuts from any vigorous, healthy trees have been chosen, and until vegetatively raised stocks are available it is desirable to select a single tree as a source of seed each year.

J. nigra: Nuts of this species have been obtained from one or two identified trees in Ontario. The species varies considerably in size of nut and thickness of shell. The indications here are that seeds from trees bearing nuts of medium size germinate better than those from trees bearing large nuts with very thick shells.

Stratifying.—The nuts on reception are stratified in slightly damp sand. Eleven-inch flower-pots make excellent receptacles. A layer of sand 2 inches deep is placed in the bottom of the pot, then the nuts three or four deep, then successive layers of sand and nuts, covering all with at least 2 inches of sand. Over this it is wise to place a slate or tile to exclude vermin. The pots are then stored in a cool place until March. Exposure up to 10° F. of frost is beneficial, especially to the germination of *J. nigra*.

Planting.—The nuts are sown in early March in rows 2 feet apart in ground which has been deeply dug. The drills are drawn so that the nuts, which are spaced 6 to 9 inches apart in the rows, are covered with 1 inch of soil. Nuts that are very light in weight or in any way bad are rejected. At least 80 per cent. germination is to be expected from this method. Care must be taken to protect from vermin, especially rooks, which will soon play havoc with the seed-bed. After germination frequent cultivations will greatly assist growth.

Fig. 97 shows typical one-year seedlings of different species, whilst fig. 98 shows three one-year seedlings of *J. nigra* from a single tree, but though all are growing under similar conditions, considerable variation in root development and vigour is to be noted.

By the end of the growing season the majority of the plants should have a diameter of approximately $\frac{3}{4}$ inch at ground level. Such plants are ideal stocks to be lifted in January for potting into $4\frac{1}{2}$ -inch "long tom" pots. Most of the plants will have a long taper root, with a good proportion of fibre. If the whole root can be manœuvred into the pot, spiral fashion, so much the better, but as walnut roots are very brittle some of them may snap, and these should be cut clean before potting. Such stocks recover quite well, although subsequent growth may not be so strong as that of the whole

root plants. Two to three inches of the main root axis should be above the rim of the pot, and upon this the scion is best grafted. This is fully described and illustrated in a previous publication [3].

(c) *Vegetative Propagation.*

Since seedling rootstocks are variable, it is necessary, at least for exact experimental work, to use uniform rootstocks. It is also desirable from an economic point of view to standardize the performance of any combination of stock and scion found to be outstandingly good. Therefore experiments have been carried out to find some method of propagating vegetatively selected parent plants. Up to 1929 the only method successfully used at East Malling was that of greenwood cuttings. No very successful attempts to raise walnuts vegetatively appear to have been previously published, and a French writer [4] has stated that the walnut never produces roots from the aerial part of the stem. Fig. 99 shows examples of two different types of root in greenwood cuttings of *J. regia*.

Fig. 100 shows a plant of *J. cordiformis*, the nut having been planted in a pot in February. The top was taken off in July and rooted and is shown beside the pot; the remaining stem in the pot was then grafted, and photographed in September.

Layering.—In the autumn of 1928 for the first time at East Malling one selected seedling plant of 'Paradox' produced good roots on 50 per cent. of the current season's new shoots as a result of layering (see fig. 101). In 1929 this method was successfully extended to a wide range of stocks. 'Paradox' again rooted well. Two selected plants of 'Royal' have given 50 and 60 per cent. rooted layers respectively. Three selections of *J. regia* gave 40, 50 and 60 per cent. rooted shoots. *J. nigra* has not generally been so free-rooting, though one plant gave 40 per cent. successes. *J. cinerea* (60 per cent. rooted) and *J. Sieboldiana* (45 per cent.) both proved amenable to treatment.

All these were sufficiently well rooted to plant out at the end of the season for further propagation.

Fig. 102 shows *J. regia* (English) and *J. regia* (*J. kamaonia*) successfully rooted from layers, whilst fig. 103 shows two selected seedlings of 'Royal' similarly rooted.

(d) *Method of Layering.*

The parent is planted in open sandy ground and encouraged to grow freely for one year. The second year a drill approximately 3 inches deep is drawn in the row. In this the *whole plant* is pegged down horizontally, some time during February, and covered with *one inch* of fine soil, while the *buds are still dormant*.

The result of this treatment is that the bases of the young shoots which push through the soil are etiolated. It is chiefly from the etiolated portion of the stem that roots are produced. Professor PRIESTLEY has worked upon the theory of this etiolation [2].

If the bases of the young stems are exposed to the action of light, they tend to harden and rooting may not occur at all. As the young stems grow, more soil should be added from time to time until they are covered to a depth of four to five inches or more.

Present indications suggest that it may be possible, in the near future, to propagate by such methods clone races of desirable varieties of walnuts, on a commercial scale and at reasonable cost. If it is found that the walnut develops slowly on its own roots such plants would serve as standardized rootstocks upon which to graft.

(e) *Grafting.*

The importance of obtaining good sound scion wood cannot be too strongly stressed.

Fig. 104 shows good and bad types of scion. On the left of the photograph is a very hollow scion, likely to prove quite useless. Next to this is one somewhat similar but with sound two-year wood at the base. Those on the right, consisting of sound one-year wood only, are, however, the most likely to prove successful grafts.

Graft wood should be cut during January. Solid shoots of one year's growth, or failing that, with a base of two-year wood, make the best scions. If such material is unobtainable and the variety is precious, most unpromising material may be tried, for with care it has often been found to provide a nucleus for further scions.

Grafting methods have been fully described elsewhere [3], but further experience warrants the inclusion of some additional observations.

The walnut often produces a "callus" around the pith area and, although this apparently takes no part in forming a union, it sometimes pushes the scion away from the stock before a union has been effected through the cambium layers. It is thus liable to inhibit union altogether unless the ties are firm and lasting. Soft cotton or fillis string is excellent tying material. Raffia is suitable for summer (July, August) grafting, when a union is very rapidly effected.

The "bark," *i.e.* the tissue, lying outside the wood of the walnut root is usually very thick. In grafting it is essential that the cambium layer of stock and scion should coincide on one side at least, the difference in size often makes coincidence on both sides impossible.

After the graft is tied it is a good plan to fill any cavities "caused by spitting the stock" with soft clay, to prevent any danger of wax penetrating between scion and stock. Paraffin wax is excellent and safe. It should be put on with a brush when it is sufficiently hot to be a clear liquid, *but not boiling*. In this state it will cover well and easily with a varnish-like finish. If it is not hot enough, it will flake and will not be found nearly so effective. A simple contrivance for heating the wax is a cheap methylated spirit lamp with tripod over the burner and a ratchet wheel to regulate the flame. This costs about 1s. 6d. Any ordinary clean tin with a wire handle, to contain the wax and a small sash-tool (painter's brush), completes the outfit.

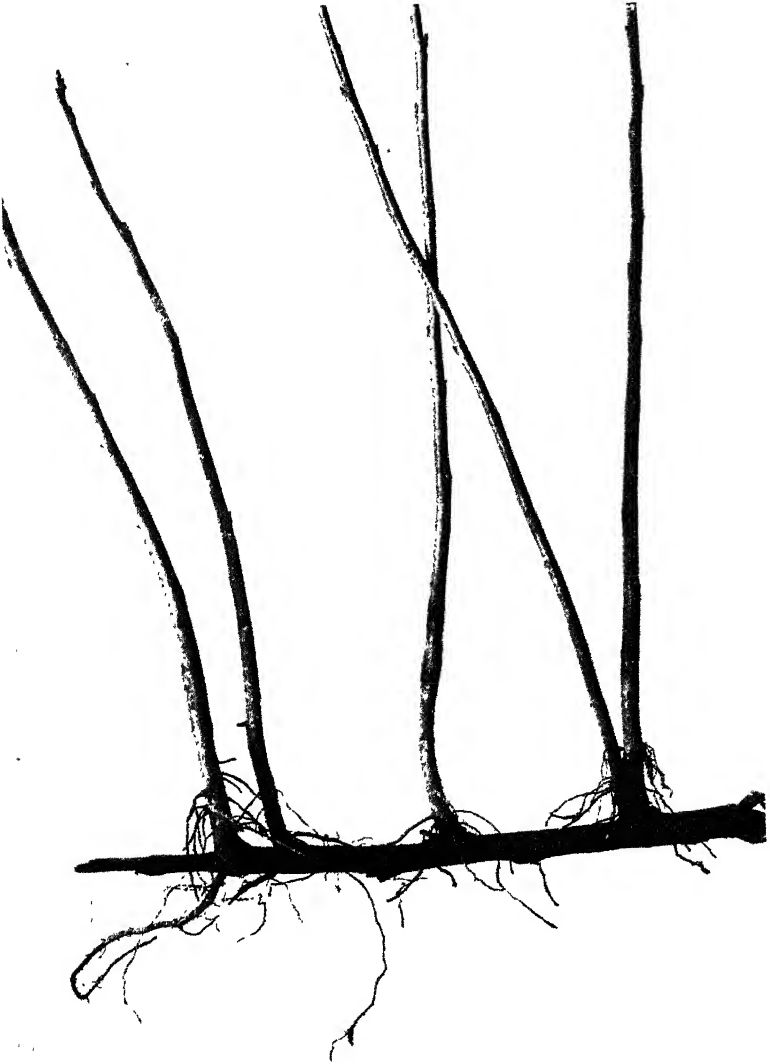


FIG. 101.—ROOTED LAYERS JUGLANS. 'PARADOX.'

[To face p. 260.]



FIG. 102.—ROOTED LAYERS.
J. REGIA, ENGLISH.
J. REGIA, HIMALAYAN.

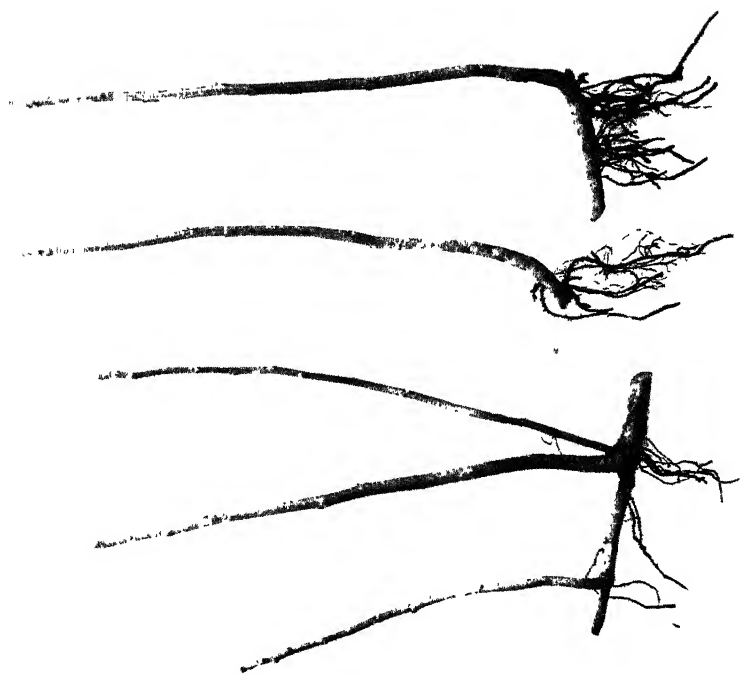


FIG. 103 — WALNUT 'ROYAL,' TWO SELECTED SEEDLINGS LAYERED.

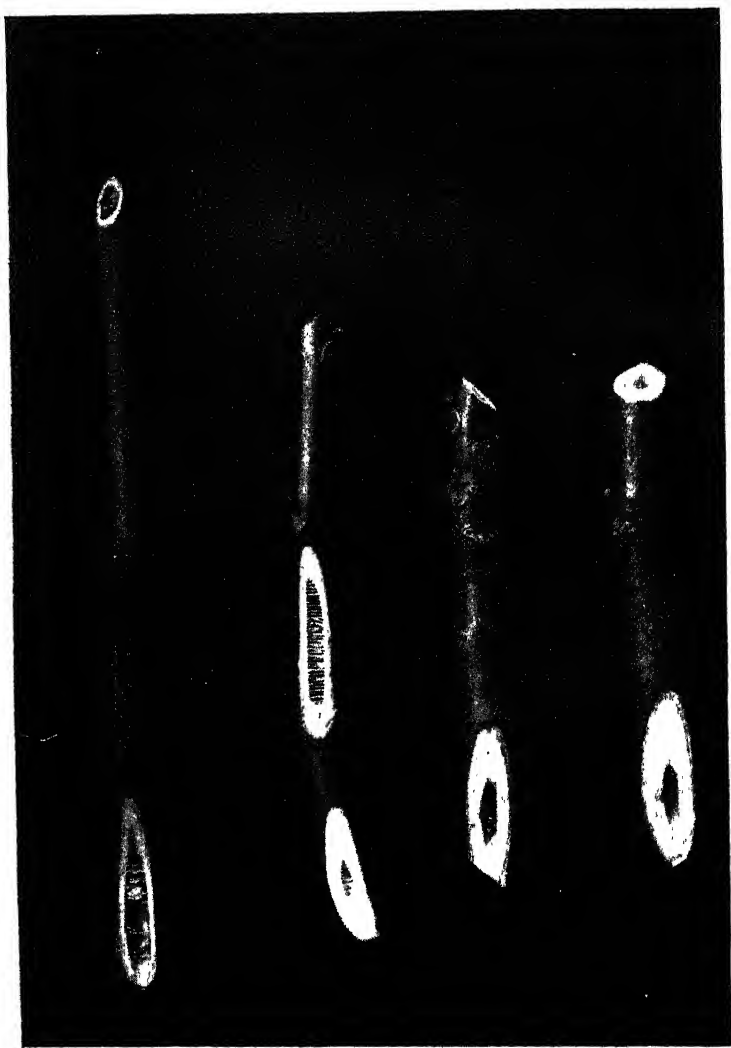


FIG. 104.—GRAFT WOOD. POOR TYPE OF GRAFT ON LEFT—MODERATE MATERIAL IN CENTRE—GOOD MATERIAL ON RIGHT.

[To face p. 261.

This outfit can be used in the field if placed inside a windproof box. It is advisable to have two containers so that one is heating while the other is in use.

There is an American heater which can be taken to the grafts, but for most purposes the outfit described will be found quite satisfactory.

Dormant Season or Herbaceous Grafting.—Records of grafting some ten varieties under glass during February and March show that there is little difference whether the plants are placed in a closed frame after grafting or on an open bench. About 80 per cent. successes have been obtained by both methods. Some varieties have yielded 95 per cent. successes. The grafted plants in closed frames are, however, quicker to form a union than those on the open bench. This enables a larger number to be dealt with in one season. Their subsequent growth shows no appreciable difference.

Such plants can be hardened off and planted in open ground in June with slight protection from Spruce boughs or the like. Although not much further growth will ensue the same year, the plants will become established, and the following year growth to a height of 3 to 5 feet may be expected according to variety.

If a variety is scarce, it is a good plan to pot some plants for growing on under glass. These will provide excellent scion wood the following season.

Fig. 105 shows a one-year plant compared with a similar plant grown under glass one year longer. Quite a number of good scions can be obtained from such plants.

Summer (July, August) grafting under glass is a commercial method (although it entails potting up the stocks the previous winter), as it can be done in glasshouses that may not be available in February and March. Moreover, small or poor scion wood can be used which would be useless for spring grafting, and the percentage of "takes" is high, 90 per cent. being quite usual with comparatively little trouble. These summer-grafted plants can quite safely be transplanted to the open ground in September. Winter losses of such plants have been almost negligible at East Malling. However, they take a year longer than spring-grafted plants to make good trees.

Plants grafted in February and March kept in 4½-inch pots grow 6 to 9 inches in the first year and are admirable for transporting long distances, as the risk of loss and cost of transport are reduced to a minimum.

At present grafting under glass is by far the most economical and satisfactory method tried at East Malling—unless more certain methods become known for open-ground conditions. If a successful and assured commercial field method for English climatic conditions could be obtained, young trees 4 to 5 feet high the same year of grafting could be produced. In view of this fact experiments in different methods and times of grafting in the field are being continued at East Malling.

Patch-budding experiments at different stages of growth are in progress. In October 1929 sections of budded plants examined under the microscope showed that a perfect union of bud shield and stock had taken place. If these buds come through the winter successfully, this will be a step forward.*

* [Note, July 1930.—Of the buds inserted in seedling *J. nigra* stocks in the open ground, July 1929, only a small percentage succeeded. Of six varieties not a single bud has grown. Of *J. regia* var. 'Ireyne' three buds out of seven have grown; of var. 'Sorrento' one out of eight; of *J. nigra* var. 'Stables' two out of five. These have produced trees from 75 to 125 cm. in height at the present time.

It seems likely that once all the factors contributing to success are sorted out, this method will prove a practical one.]

The following methods were employed, the work being carried out in early August. Small buds on two-year wood were sometimes used, but the *small* buds on the lower part of shoots of the current season's growth proved the best. If the leaves over these buds are cut off, leaving 2 to 3 inches of petiole attached to the shoot about ten days before use, the leaf-stalk will easily push off at the time of manipulation and inconvenience in budding, owing to the swollen leaf base, will be avoided. The bud will also be in better condition.

Knife.—A two-bladed knife, formed by fixing two small scalpels to a block, exactly parallel, 1 inch apart, is useful to make the cuts coincide exactly on stock and bud shield. Two parallel horizontal cuts are made in the stock and one vertical cut to connect them on one side. Similar cuts are then made on the bud stick, and the piece of bark with bud attached is peeled away, great care being taken that the *axis or base of the bud is not injured*. The bark of the stock is then peeled back and the bud shield fitted to fill the cavity exactly. The bark flap of stock is then cut so that the edge coincides with bud shield. The shield is then tied firmly but not tightly, and lightly paraffin-waxed over all. It is necessary to loosen the ties and retie after ten days.

THOMAS ANDREW KNIGHT [5] wrote as follows concerning walnut budding. "There are at the base of the annual shoots of the walnut, and other trees, where those join the year-old wood, many minute buds, which are almost concealed in the bark, and which rarely or never vegetate, but in the event of the destruction of the large prominent buds which occupy the middle and opposite ends of the annual wood. By inserting in each stock one of these minute buds and one of the large and prominent kind, I had the pleasure to find that the minute buds took freely while the large all failed, without a single exception. . . . The most eligible situation for the insertion of buds of this species of a tree (and probably of others of similar habits) is near the summit of wood of the preceding year, and of course, very near the base of the annual shoot, and if buds of the small kind above mentioned be skilfully inserted in such parts of branches of rapid growth, they will be found to succeed with nearly as much certainty as those of other fruit trees, provided such buds be in a more mature state than those of the stocks into which they are inserted "

(f) Top-grafting Experiment.

A seedling walnut tree approximately twenty-five years old was headed in March 1927. The method adopted was whip and tongue grafting described in [3]. Trees to be top-grafted should be partially "headed" in January or left until the end of March, as they are very liable to bleed profusely if cut at an intermediate date. Several branches to act as "sap drawers" should be left untouched, until the scions have made considerable growth. Any growths arising below the grafts must be removed from time to time, and the scion shoots supported to rods fastened to main branches, or the whole graft is liable to be blown out by wind.

In April forty-three scions of ten varieties were put into branches varying from 2 to 4 inches in diameter. The number of these that grew was only five. In April 1928 the same tree was regrafted, chiefly on strong young shoots resulting from the heading back in 1927. Of thirty scions grafted twenty-two succeeded.

Fig. 106 shows on the left the top-grafted tree. The tree to the right in the picture is an ungrafted seedling walnut approximately thirty years old.

Where it is desired to graft branches having a greater diameter than 2 inches, it would be better to shorten them a year previous to grafting and then to graft on strong one-year-old shoots which grow as the result of cutting back. Not more than three young shoots should be allowed to grow from each branch.

The care of these grafts is fully described in the report already referred to [3].

(g) Precocity in Bearing.

Precocity in bearing in grafted walnuts is illustrated by the fact that in 1929 a few nuts were gathered both from the 1927 and 1928 scions. Nuts have also been quickly produced on young pot-trees.

Fig. 107 shows a plant which was grafted in August 1926 with a scion having a terminal flower-bud. The photograph was taken in July 1927.

Fig. 108 shows another plant grafted in March 1928 and photographed in September 1929. Both these plants were grown under glass and were hand-pollinated.

(h) Pollination.

Walnut flowers are unisexual and borne on the same tree, the nutlets (pistillate flowers) on a short stalk at the end of the young shoots of the new growth, and the catkins (staminate flowers) singly or in pairs, in the leaf axils of the preceding year. Young trees, both seedling and grafted, often bear nutlets years before catkins appear.

Unless suitable pollen (which is wind-borne) is available from trees within a radius of approximately 200 yards, no crop is likely to be produced. Even when both kinds of flower are present, they are not always ripe at the same time. Cases occur where the pollen is all dispersed before the stigma is receptive and no crop is obtained.

Pollen-bearers.—It has been observed that some varieties, such as 'Woodland' (California), bear catkins when quite young, and if proved hardy it could be interplanted to procure early cropping.

It is very desirable that more systematic observation on the non-setting of walnuts (with consequent loss of crop) should be undertaken.

(j) Frost Injury.

The young growth of walnuts is very susceptible to frost injury, and the stigma is especially tender. Even 2° F. of frost, if early morning sun reaches the flowers, is sufficient to destroy the chance of a crop, hence the value in some seasons of late starting into growth. Under East Malling conditions some varieties are late in leafing.

During the night of April 26–27, 1927, 12° F. of frost was registered at East Malling. Many varieties of walnuts had 3 to 4 inches of new growth which was entirely killed; in some cases young plants were destroyed outright, but older plants ultimately recovered. The undermentioned varieties, however, were still dormant and escaped injury:—

Franquette,	Parisienne,
Mayette,	Treyve, and
Meylanaise,	Vourey.

The first five of these are considered to be the cream of the French varieties.

(k) Compatibility.

Although a wide range of stocks has been tested, so far no definite evidence of incompatibility has been found between stock and scion in *Juglans* species. *Pterocarya caucasica* and *P. sinensis* were tested in an endeavour to extend the possible range of stocks for walnuts, but although an apparently good union was effected and a few inches of growth made, in 80 per cent. of the cases the scions of *J. regia* put on to these stocks failed to continue growth and the majority died the same season.

(l) Timber Trees.

Vegetative propagation is valuable not only for the multiplication of trees bearing superior nuts, but also for the multiplication of outstandingly good timber trees, especially for those showing great growth vigour. Some of the hybrids give especial promise in this respect.

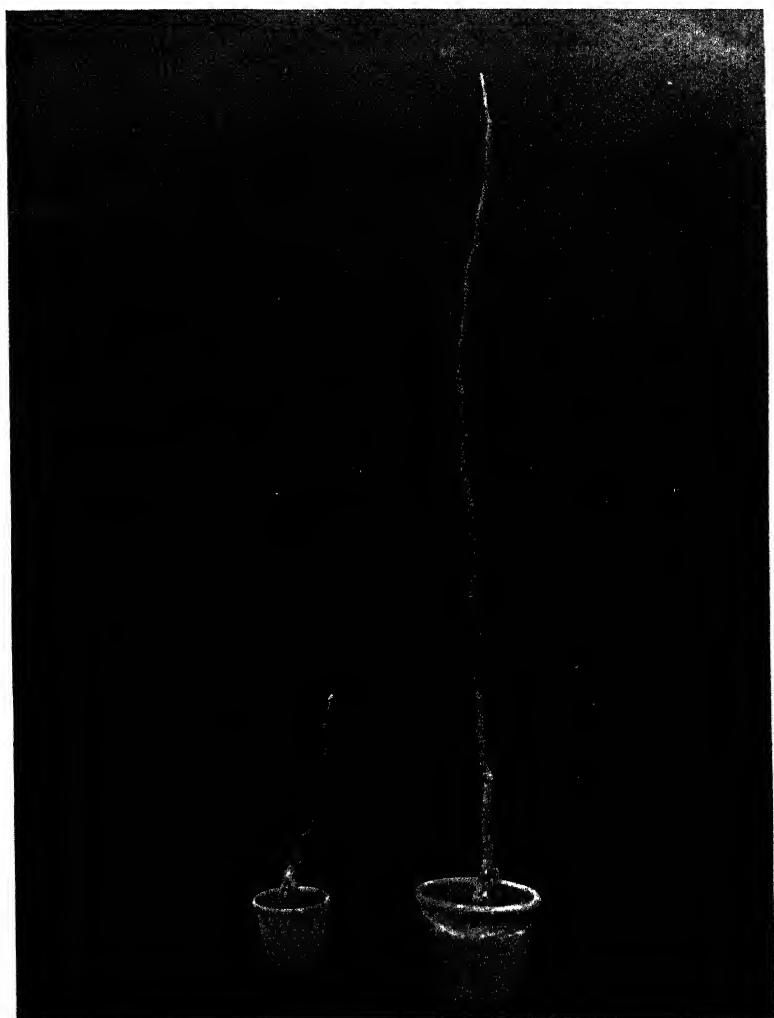


FIG. 105.—ONE-YEAR GRAFTED PLANT, AND SIMILAR PLANT GROWN UNDER GLASS A YEAR LONGER.

[To face p. 264.]



FIG. 106.—TOP-GRAFTED WALNUT TREE APPROXIMATELY TWENTY-FIVE YEARS OLD.

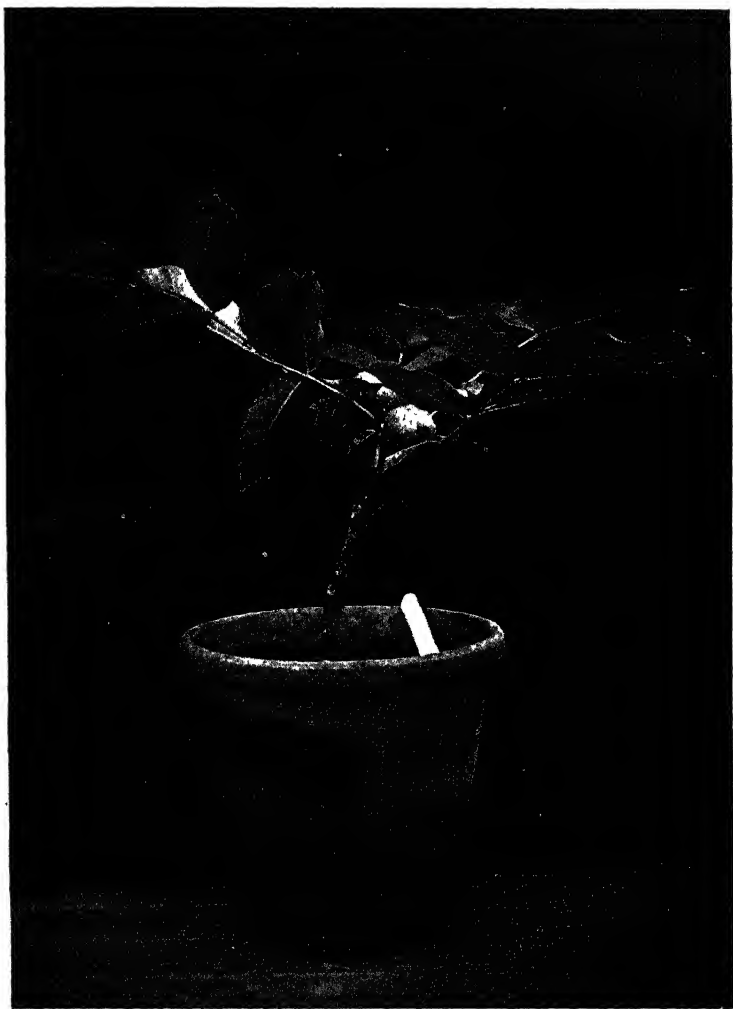


FIG. 107.—GRAFTED IN AUGUST WITH SCION HAVING A TERMINAL FLOWER-
BUD, SHOWING NUTS ON ORIGINAL GRAFT.



FIG. 108.—GRAFTED MARCH 1928, PHOTOGRAPHED SEPT. 1929 (SHOWING NUTS ON NEW WOOD PRODUCED AFTER GRAFTING).

[To face p. 265.

Experimental work is in hand in relation to the cause, and possible transmission, of the peculiar burr development found occasionally on walnut trees and which afford such beautiful figure and grain.

(m) *Varieties.*

A collection of varieties has been assembled at East Malling both for purposes of testing as rootstocks and for their fruit.

Clone races of the following are being raised vegetatively for testing as rootstocks:—

<i>Juglans regia</i>	.	.	.	.	.	6 selections
<i>Juglans nigra</i>	.	.	.	.	.	3 „
<i>Juglans californica</i>	.	.	.	.	.	I „
<i>Juglans cinerea</i>	.	.	.	.	.	I „
<i>Juglans mandschurica</i>	.	.	.	.	.	I „
'Royal' (hybrid)	.	.	.	.	.	4 „
'Paradox' (hybrid)	.	.	.	.	.	3 „

The following species and varieties are being tested for their fruit: *Juglans regia*.—Twelve selected seedlings of English origin, four from Cyprus, and three from Persia.

The following named varieties of *Juglans regia* are also under trial: seventeen American, one Canadian, eight French, one Belgian, one Italian, one Algerian, and four *Juglans nigra* of Canadian origin.

Finally, two "Burred" specimens are being tested for their timber value.

The writer desires to acknowledge with thanks the assistance given and suggestions made by Mr. HOWARD SPENCE and Mr. R. G. HATTON in putting together the foregoing note.

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THE FLORA OF THE EQUATORIAL HIGHLANDS OF AFRICA.

By T. ALEXANDER BARNES, F.R.G.S.

[Read July 30, 1929 ; Mr. W. HALES, A.L.S., in the Chair.]

HAVING travelled in Africa very extensively during the last thirty years, I returned about two years ago from an expedition and was invited by this famous Society to give a lecture on the Flora of Africa. At that time I did not think I had enough material to interest you, so I had to refuse the invitation as I am quite an amateur botanist, although a lover of flowers. I am really an entomologist, but during my entomological work I learn a good deal about the flora on which insects feed, so I have a fairly comprehensive knowledge of African plants. As I remarked, last time I came home I did not think I had enough material, but since then I have made an expedition to the islands in the Guinea Gulf. They are four in number, known as Fernando Po, Prince's, St. Thomas, and Annobon. I was so struck with the flowers there and plant life in general, and they appeared to me so very uncommon, that they awakened my keenest interest. On this occasion I took a number of photographs, and during that expedition I added considerably to my knowledge of botany, so that now I have something that I think will be worth while telling you about.

From a map you will see the position of the Guinea Islands, two of which are Portuguese and two Spanish. They are quite easily reached from Europe, and you can get out there in about seventeen days from Lisbon. Curiously enough, the flora on one island differs from the flora on the next island. They became isolated many thousands of years ago, and each island has evolved a special flora of its own. The Begonias are especially interesting, and as the islands rise to very high altitudes, one gets both lowland and highland forms. On the high peaks, one of which goes up to 10,000 feet, the rarest plants are to be found. It would be most interesting for anybody to make a trip there for plant-collecting purposes. Nobody realizes how easy it is to get to these islands. They are quite as beautiful as the South Sea Islands, and very much easier and quicker to get to. Some of you might bear that in mind if you want to make a valuable botanical collection and obtain some really good and new things. If you go to Prince's Island or to St. Thomas or Fernando Po, you will certainly come away with something new and valuable. The interior of the islands has been very little explored botanically. GUSTAV MANN many years ago made a fairly comprehensive collection

when he visited them, but Prince's Island and Annobon have been left out and there is a great deal to be done there.

After describing to you the special plant forms of the Guinea Islands I will next tell you something about the curious vegetation that exists on the Ruwenzori Mountains. I made a journey up the Congo River to the borders of Uganda, and I climbed those wonderful mountains and camped on the snow-line beneath their summits. Probably the most beautiful flowers in Africa grow at great elevations near what is known as the timber line where trees no longer thrive and where the moorland regions begin.

With the aid of a map, it will be interesting to trace the portions of Africa where this Alpine flora exists. They are small plateaux or in some cases just mountain tops. There is, to start with, the Cameroon Mountain which goes up to 18,000 feet. Then there are the Guinea Islands which I have referred to: they also constitute a portion of what you might call the Alps of Africa. Then northward on the Atlas Mountains you get an Alpine flora, but this rather differs from the Equatorial forms. The next alpine area is thousands of miles distant on the Ruwenzori Mountains and on the Kivu volcanos which lie to the south of them, and then north-east we have Kilimanjaro, Mount Elgon, Ngorongoro, and the Abyssinian Highlands. Apart from these regions there is no other part of Africa that rises to great heights until you get right down to the south of the continent in Cape Colony, to Table Mountain and the Drakensberg. The six regions that I have just enumerated are the only portions of Africa where this special Alpine vegetation remains.

On coming close to Prince's Island you find a wonderful beach formed of lava. It is a volcanic island with a very rich soil formed over the lava beds; the vegetation is very luxuriant indeed. In the background are great cliffs which run up to 3,500 feet forming the base of a great volcano.

The rich vegetation is composed mostly of papaws, bananas, and cocoa trees, and on the shore line are oil and coco-nut palms, sugar cane, and so forth. They all grow very luxuriantly on the volcanic soil and at the mouths of the numerous rivers and waterfalls. On this and the neighbouring islands the Portuguese have grown cacao very extensively: in fact, I think Portugal and Spain are supplied entirely from the Guinea Islands.

The great peak of St. Isabel is on Fernando Po, and it rises up to 10,000 feet almost directly from the sea. It is a very stiff climb to get up to the top and usually takes three days on account of the thickness of the vegetation. At the summit one finds a moorland country, covered with great stretches of heather of giant growth and many beautiful blue *Lobelias*—not the lowly form of our own gardens, but giants standing 15 feet high. The palms of this region are magnificent: the oil palms which are cultivated for oil and soap making, and, of course, the coco-nut. There is also the feathery raffia used so much in basket making and weaving, and, on the

mainland, that most wonderful climbing palm, the Calamus, which sometimes attains a length of over 300 feet, climbing both vertically and horizontally over other trees in great loops of prickly rope-like stems.

Amongst this setting of palm trees, often, in the still and dark waters lapping their corded roots, may be seen a very beautiful thing, the water Crinum (*Crinum natans*). I tried to get some of the bulbs, but they grow unusually deep down in the bed of the river, and after several attempts I had to give up such a wet and difficult task.

Some of the most archaic of plants, the Cycads, representatives of one of the oldest floras in the world, grow fairly abundantly on the island of St. Thomas, having been imported there from Brazil. Many millions of years ago when the world was in its very early stages of evolution and great club-mosses and giant ferns flourished, amongst them were the Cycads, and they have come down to us to-day from that remote age very much in the same form as then; they have not altered very greatly in their structure. They look like a cross between a fern and a palm, forming a thick crown of coarse hard fronds on the head of the stem.

I have already mentioned what a wonderful place these islands are for Begonias. On the island of St. Thomas there are six or seven species which are only found on that one island, and nowhere else in the world. Amongst them is *Begonia baccata*, and I was fortunate enough to get some seeds and bring them back to my friend, Mr. JAMES J. JOICEY, of The Hill, Witley, Surrey, a very old member of this Society and an amateur orchid grower. The seeds were taken in hand by his head gardener, who has propagated three plants of this beautiful Begonia. An old plant grows up to 7 or 8 feet in height with huge trusses of bloom. You must imagine a Begonia considerably taller than I am, with massive leaves, and beautiful waxy pale pink flowers growing in great clusters. It is the only Begonia which has a large fruit and bears bright cardinal-red berries like a small cherry which are a mass of tiny seeds within. So this Begonia is now growing in England, which is rather a triumph, considering the difficult climatic conditions. The plant itself grows on the Equator in an environment of sea mists and miasma from the thick forest vegetation at an elevation of 6,000 feet, a combination of conditions that it is difficult to produce artificially in this country.

Costus gigantea, another giant, grows up to 15 feet in height and has great poker spikes several pounds in weight, out of which come one or two little yellow orchid-like flowers perched exactly like a butterfly on the top or sides of the great spikes. It is a handsome plant indeed, which I have never yet seen in any botanical garden in Europe. It is common all over St. Thomas on the high mountain slopes.

Then there is another very rare plant, *Calvoa crassinoda*, which has a peculiar parallel veining to the leaf. It is a very showy bush-like plant with fine bunches of pink blossoms.

The natives of these islands are a most interesting people, who

are great gardeners and cultivators, especially on the large island of Fernando Po. They live on the highlands at 6,000 feet and make fine gardens of tania and yams. The latter, which is a climber, is trained up a trellis-work between the lines of tania plants. They also grow immense gourds for making into calabashes. Amongst the outlandish customs of these people is that of slashing the face with cuts horizontally, a method employed in the olden days to make them look fierce in war. The hats they wear are most peculiar—a sort of umbrella hat made from skin to protect them against sun or rain.

To go back to the plants of Fernando Po. One of the most peculiar things I found on the island was a gigantic *Amorphophallus*. One of which I took a photograph is apparently a new species. It is about 4 feet 6 inches in height. I sent the photograph back to a friend of mine on the island asking him to do all he could to get a bulb, as it was a very rare plant, and even if he could not get a bulb, to get the flower. That was two years ago, but no plant has been located there since. Whether it is dying out, or has died out, or flowers only every five or six years I do not know, but it has not been seen since I left, and is evidently a very rare species.

In Fernando Po, which has numberless extinct craters dotted over its surface, one finds many of these containing water, forming small lakes of great beauty, as the water's edge is usually ringed with tree ferns and water lilies and other aquatic plants. As there is a continual mist at 7,000 to 10,000 feet, either blowing off the sea or coming from the forest, ferns, lichens and epiphytes grow in great profusion everywhere, every tree branch bearing a wealth of them. There are forests of tree ferns in places: in fact, the natives of the island build their houses from the trunks of these giant ferns. They have a very hard fibrous bark and centre, and are practically indestructible. The natives use these fern poles year after year: if for any reason they require to make a new hut they use the poles from the old one. That will give some idea what a hard stem a fern can have.

There is only one pine tree to be found on this group of islands, and that occurs on St. Thomas. It is one of the rarest in the world, as it is peculiar to this island and then only found in the region of the peak. It is named *Podocarpus Mannii*. Two seedlings were brought down from the mountains and planted on the lower levels, and they did very well. It is a handsome tree with a peculiar leaf and well worth cultivating in England. Seeds could easily be obtained, and if any of you are interested I shall be glad to make arrangements to import some seeds from the island. It is also on the Peak region of St. Thomas that the red giant *Lobelia* (*Lobelia thomensis*) is found, and near the *Lobelia*, a climbing *Begonia* with a very curious leaf indeed, each bright green leaf having a red border or edge to it.

This Peak region is a moorland country not unlike parts of Scotland, only the heather to be found there grows about ten or twelve times the size of our heather. We had great difficulty with

water when up there. You will be astonished at that, as I have been telling you of the heavy mists, but on the peak the water all soaks away into the very porous volcanic soil or runs off the steep declivities.

Cocoa is the principal product of the island, and in these equatorial islands usually one sees ripe and unripe fruit, forming fruit and buds and flowers, all together on the same tree. That is the usual effect of the climate on plant life there: it rushes on from one stage to another, with no definite time of rest such as we know in northern climes.

Passing from these islands to some of the high plateaux of the mainland, many of the alpine meadows to be seen on the Ruwenzori Mountains and Kilimanjaro, for instance, are perfect gardens of beautiful plants, and amongst them may be found such plants as Geraniums, Anemones, Violets, Mallows, Lupins, Delphiniums, Mint, Thyme, and so on. In one place in Tanganyika I came across a mass of wild clover extending for several miles. Great herds of wild game were feeding on it. Some very beautiful Anemones were growing in the same place with blooms about 4 inches across, also a scented Larkspur, *Delphinium candidum*. Crinums were to be seen in great profusion, and a purple-flowered Mallow with 6-inch blooms.

Then there is that grotesque inverted plant, *Adenia globosa*, with an immense bulbous growth forming a kind of trunk which is about 5 feet across. It is a desert-loving dwarf tree, very prickly and hard and thorny.

[The lecture concluded with a series of moving pictures of the districts traversed, upon which the lecturer made a running commentary.]

THE "SHAB" DISEASE OF LAVENDER.

By C. R. METCALFE.

FOR many years large-scale cultivators of Lavender have been troubled by a serious disease in their crops, resulting in a grave reduction in the yield of flowers and the death of many bushes. The disease occurs also in nurseries and private gardens, where it may likewise become very serious. This trouble, which is commonly known as the "Shab" disease, was first investigated scientifically in 1916 by BRIERLEY, who showed that the cause was a fungus called *Phoma lavandulae* Gab.* Recently, however, the disease has been re-investigated by the present writer, thanks to the Ministry of Agriculture and Fisheries having provided a grant to enable the work to be carried out. The investigation was conducted mainly at the Cambridge University Botany School under the direction of Mr. F. T. BROOKS of that University, but facilities were provided by large-scale growers in different parts of the country to enable the writer to make observations on the disease as it actually occurred in their plantations. The writer wishes to express thanks to Mr. BROOKS and all those growers who co-operated in carrying out the investigation, without whose help it would have been impossible to bring the work to a successful conclusion.

APPEARANCE AND CAUSE OF THE DISEASE.

The disease can be seen at any time of the year, but is recognized most easily from May onwards throughout the summer. In the spring it usually first attracts attention when certain of the young shoots begin to wilt, and in many instances the affected twigs take on a characteristic yellow colour. If the subsequent behaviour of the affected bushes is closely followed, it will be seen that other branches lower down on the plant become affected in the same way, and still later on the disease extends upwards into hitherto healthy branches, which begin to wilt in like manner. When once a branch has become infected it does not recover, and when all the branches have become diseased the plant dies.

That the disease is an infectious one becomes apparent within a comparatively short time—it may be a matter of a month or two or only a few weeks—when neighbouring plants begin to exhibit similar wilting symptoms. In this way patches of dead plants arise among the healthy ones, and if no remedial measures are adopted the disease usually develops serious proportions. The appearance

* BRIERLEY, W. B. "A *Phoma* disease of Lavender." *Kew Bull.*, 1916, pp. 113-131.

of a set of plants that have been killed by the disease is shown in fig. 109, the dead bushes in the foreground being in marked contrast to the healthy ones behind them. All these bushes were the same age.

If the small dead twigs of a diseased bush are examined with a strong magnifying glass, small black dots may sometimes be distinguished on them. These are the spore capsules (pycnidia) of the fungus *Phoma lavandulae* Gab., which, as BRIERLEY concluded, is the primary cause of the disease. It is frequently difficult to see these spore-producing bodies, but they may be made more readily visible by immersing the shoots for a few moments in water.

MODE OF INFECTION AND SPREAD OF THE DISEASE.

When it rains, minute spores emerge from the spore capsules and may then be splashed on to adjoining plants. It has been discovered that the spores are unable to infect a Lavender plant, unless they happen to alight either at a point where a leaf is attached to a young shoot, or on a freshly made wound such as those that are produced when the crop of flowers is cut. When spores alight on either of these places they germinate and put out hyphae which grow within the tissues of the Lavender plant and so induce the disease symptoms already described. When a wound is more than a month old, or when the young shoots become covered with bark, the fungus spores are no longer able to infect them.

The spores are so small that they are not well adapted for dispersal over wide areas by wind. It has been found, however, that small pieces of diseased twigs bearing pycnidia are frequently spread over wide areas by workmen, implements used to cultivate the crop, and also by the wind. Having been distributed in this way the spores come out when it rains, and may then infect bushes in a hitherto healthy part of the plantation.

Probably the commonest way in which the fungus becomes distributed is by striking cuttings taken from diseased plants. If this is done it frequently happens that the "spawn" or mycelium of the fungus is present in the cuttings from the start, under which circumstances it is scarcely surprising if the young plant subsequently develops the disease. An important point to bear in mind in this connexion is that a long interval elapses between the time when a spore infects a Lavender plant and the first appearance of clear disease symptoms. During this interval—which is seldom less than two months and may be as much as a year or more—the fungus is latent within the tissues of the bush, and plants infected in this way may act as "carriers" of the disease.

GROWTH OF *Phoma lavandulae* ON DIFFERENT VARIETIES OF LAVENDER AND OTHER PLANTS.

Experiments have shown that *Phoma lavandulae* can infect most varieties of Lavender. On the other hand, the variety 'Dwarf French'



FIG. 109.—LAVENDER PLANTS IN FOREGROUND KILLED BY "SHAB" DISEASE.
HEALTHY PLANTS IN BACKGROUND OF SAME AGE.

[To face p. 272.



FIG. 110.—THE FIVE CUTTINGS NEAREST THE RULER ARE OF THE TYPE RECOMMENDED. THEY MAY BE TAKEN FROM SUCH A SHOOT AS IS SHOWN ON THE EXTREME RIGHT.

appears to be completely immune from the disease, and every effort to infect plants of this variety has failed. *Lavandula dentata*, which can only be grown under glass, is also immune.

A common weed in many Lavender plantations is *Chenopodium album* (White Goosefoot, Fat Hen, or Dungweed). It has been found that if the dead remains of this plant are left about in a plantation in which the disease is present the fungus may become established on them. The fungus derived from this source has been used to inoculate healthy Lavender plants, and has been found to give rise to the disease in the same way as does the fungus from diseased Lavender itself. Thus the Goosefoot may enable the fungus to tide over the period between two consecutive crops on the same land, and every effort should therefore be made to remove this weed.

INJURY TO LAVENDER RESULTING FROM OTHER CAUSES.

It is unsafe to assume that any Lavender plant which becomes unhealthy in appearance is suffering from the effects of the fungus disease just described. Indeed, there are several other factors which induce symptoms which are very similar to those of the "Shab" disease. The chief of these is frost, which may kill the plants outright if it is sufficiently severe, newly planted bushes being most susceptible to this form of injury. Less severe frosts may kill a few branches only, and in late spring the young developing shoots frequently turn yellow and die if the weather is cold sufficiently late in the season.

To obtain the best results, Lavender must be cultivated on a light well-drained soil, and every effort should be made to ensure that it is not shaded by trees or buildings, as otherwise the plants are weak in growth, and exhibit symptoms that might readily be mistaken for those of "Shab" attack.

CONTROL MEASURES.

Since the ' Dwarf French ' variety of Lavender is the only one that appears to be immune from the disease, and as for many purposes this variety is not so suitable as the taller ones, it is necessary to adopt other measures to control the disease.

1. It has already been pointed out that the fungus "spawn" grows *inside* the diseased Lavender stems. For this reason it is impossible to "cure" the disease when once it has become established. Indeed, any attempt to control the disease where it is firmly established is waste of time, and the only remedy to adopt is to burn all the bushes. Moreover, since diseased stems bearing spore capsules are inevitably left about when this is done, it is unwise to plant Lavender on the same ground for at least a year.

2. Where possible it is best to introduce a fresh stock of healthy bushes from some outside source. Here again it is important to be absolutely certain that the stock is really free from disease, as it must be borne in mind that healthy-looking bushes may act as "carriers"

if they come from a plantation in which the disease is present. For the same reason it is useless to cut out diseased branches from a lightly infected bush in an attempt to "cure" the disease.

3. If the bushes are trimmed drastically with shears in early March, it is sometimes possible to prevent the disease from spreading in a plantation. This is because most of the infections take place in autumn through the wounds made when the flowers are cut. During the ensuing winter the fungus grows only slowly within the host tissues, so that a drastic trimming in March may remove most of the newly diseased twigs below the points to which the fungus has advanced within them. Shoots within which the fungus is latent would also be removed by these means. Only those plants that are newly infected can be dealt with in this way, the method being of no avail with bushes that are already badly infected. It is important to collect together and burn the clippings, as spore capsules may develop on them and produce spores capable of reinfecting the plants. In one large-scale experiment on these lines involving 3,443 Lavender bushes, half of which were trimmed and half left untrimmed, it was found that during the ensuing summer the disease spread to 887 fresh plants amongst those that had not been trimmed and only to 425 amongst those that had. It is thought that the results would have been even more promising if it had not been necessary to arrange the clipped and unclipped plots so that they were intermingled, as it would not then have been possible for the clipped bushes to become infected from their unclipped neighbours. Spring clipping, in addition to controlling the disease, keeps the plants in good shape, and the flowers are remarkably large and fine. On the other hand, the time of flowering may be somewhat delayed, and where this is a disadvantage it is not recommended that the practice should be introduced.

4. Where possible, Lavender bushes should be set out at least 4 feet apart in both directions. This facilitates cultivation, the bushes grow extremely vigorously, and spores of *Phoma lavandulae* are not so liable to be splashed from plant to plant by rain.

5. It has been found that if Lavender is propagated only by taking extremely small cuttings not more than two to two and a half inches long, and consisting only of "green" wood, it is possible to raise a perfectly healthy stock from which one is diseased. The cuttings should be of the same type as the five pieces of Lavender nearest the ruler in fig. 110. Cuttings should be taken from twigs such as that shown on the extreme right of the figure. Many thousands of cuttings have been taken in this way both from healthy plants near diseased ones and even from plants that were themselves diseased, and have given rise to perfectly healthy young plants. They are best started in boxes of light soil in a greenhouse or cold frame, but will also grow out of doors in a sheltered place. Small cuttings of this type root very readily, grow rapidly, and make well-shaped bushes. A few plants may become diseased even under these circumstances, but these may be readily weeded out while they are still in the boxes. As

a result of the extensive experiments carried out on this method of propagation it has been concluded that this is one of the most promising ways of controlling the disease.

SUMMARY.

1. The "Shab" disease of Lavender has been the subject of an extensive investigation at the Cambridge University Botany School, and on the premises of large-scale cultivators of the crop.

2. The disease has been proved to be due to a parasitic fungus called *Phoma lavandulae* Gab., thus corroborating the conclusion already reached by BRIERLEY. However, frost, waterlogging, and shading by trees may also cause symptoms which might be mistaken for those of the "Shab" disease.

3. The symptoms, development, and modes of infection and spread of the disease are described.

4. The ' Dwarf French ' variety of Lavender is immune from the disease.

5. *Phoma lavandulae* can grow on the dead remains of *Chenopodium album* as well as on Lavender.

6. Practical measures by which the disease may be controlled are described.

.. THE AWARD OF GARDEN MERIT—XVI.

By F. J. CHITTENDEN, F.L.S., V.M.H.

119. DIMORPHOTHECA AURANTIACA.

Award of Garden Merit, April 8, 1929.

In 1902 Mr. CHARLES AYRES, of Cape Town, sent to Messrs. BARR, of Covent Garden, seeds of a plant collected in Little Namaqualand which he thought to be an *Arctotis*. When the plants raised flowered they were found to be not an *Arctotis* but *Dimorphotheca aurantiaca*. It was grown on the "rockwork" at Wisley (the first small rock garden there) in 1908 and there attracted much attention, and in January 1909 it was well illustrated by a coloured plate in the *Garden* (plate 1365).

This was the first appearance in Europe of the present race of *D. aurantiaca*, and though many well-known books of reference do not mention it, and though it is a comparatively recent acquisition, it is now widely grown as an annual and might well be grown even more widely. It calls for no special cultivation and may be sown outdoors or grown under glass in spring and planted out. It opens its orange flowers while in quite a young state and continues to grow and flower for months. Like so many of its relations and many of the flowers of its country it is one for a sunny place for it opens only in the sun, and this is a drawback, but it is the only one. Grown as an annual its stems spread close to the ground, which it quickly covers with its grey-green leaves, and the flowers rise singly, on erect stems to about 9 inches in height. It may be grown in the border, but if annuals are tolerated on the rock garden it will be equally well suited there.

In its home *D. aurantiaca* is a perennial with a woody base, and when first cultivated in Europe it was grown as a perennial greenhouse plant and propagated both by cuttings and seed, but it seems to have been lost subsequently, perhaps because it had not really been distinguished from some rather less attractive relatives. Its garden history seems to be somewhat as follows:—

AITON described a plant in his *Hortus Kewensis*, vol. 3, p. 271 (1785), introduced by MASSON from the Cape in 1774, under the name *Calendula Tragus*, and one was figured in the *Bot. Mag.*, t. 408 (1798), with that name under the impression that it was identical with AITON's plant. In the second edition (vol. 5, p. 168, 1813) AITON accepted this figure as his plant. Meanwhile VENETAN in *Jardin de la Malmaison* (1803), pl. 20, figured *Calendula flaccida*, and a little later

PERSOON, regarding his figure as showing relation to Aiton's plant, called it *Calendula Tragus* β. JACQUIN also figured a plant under the name *C. Tragus* in *Plantarum rariorum Horti Caesarei Schoenbrunnensis*, 2, t. 153 (1801), and another figure appears in *Bot. Mag.* t. 1981 (1818) as *C. Tragus* β, with white flowers and a coloured reverse, the figure having been made from a plant sent by Mr. WILLIAM KENT "from his very curious collection of exotics at Clapton." JACQUIN's figure was not unlike the last and probably represents the same species for which A. P. DE CANDOLLE (*Prodromus* 6 (1837)) retained the name *Tragus* (removing it to the genus *Dimorphotheca*), and the orange form pictured by VENETAN and in *Bot. Mag.* 408 and again in *Bot. Reg.* t. 28 he distinguished as a distinct species and called *D. aurantiaca*.

The plant figured in *Bot. Reg.* t. 28 came from Messrs. Colville's nursery in King's Road, Chelsea, and we read there that it was generally known in nurseries as *Calendula aurea*, but of its origin nothing was definitely known.

Two distinct plants therefore were confused, and they are now known as *Dimorphotheca Tragus* DC. with flowers white within and purplish brown without, and *D. aurantiaca* DC. typically with orange flowers. The former was introduced in 1774, the latter some time before 1798 but apparently lost until Messrs. Barr obtained it and distributed it in the early years of this century.

The so-called white forms of *Dimorphotheca aurantiaca* probably belong to *D. Tragus*.

120. *CALTHA PALUSTRIS* PLENA.

Award of Garden Merit, June 10, 1929.

Caltha palustris is a native, one of the brightest of spring flowers, making semi-shaded marshy places glow with its big yellow cups, like a great buttercup but rightly distinguished by its size as the "Kingcup" and widely known as the "Marsh Marigold" on account of its colour; and it has a "common" name in nearly every European country. A plant so common and so widely distributed is little likely to be brought into gardens and cultivated, yet this, like nearly all plants of wide distribution, has a host of varieties, and it would be an interesting task to seek out its various forms from the Arctic and the whole of Northern Europe, Iceland, France, Northern and Central Spain, Italy, the northern parts of the Balkans, Russia, Caucasus, North and Temperate Asia, and North America and compare them growing side by side in a moist border or a marsh (where they will grow easily), assured of some reward in brilliance of flowering and of an intellectual exercise in distinguishing their characteristics and seeing how far they are retained in a new situation. If one then desired to go farther, there are other species beside *Caltha palustris*, some sixteen in all, extending into South America, Australia, and New Zealand.

The plant to which the Award is given was first described by HUTH in 1877. It differs from the common form of *C. palustris* in being dwarfer and more compact but with the same glossy deep green leaves, and in having all the stamens changed into yellow sepals or staminodes so that a fully double flower is produced. It is rare in nature, but is now widespread in gardens.

The best place to grow it is on the side of a pond, where it will flourish in the damp earth and where its multitude of flowers will be reflected in the water. Like all double flowers these last longer than the single and, unlike some, they do not suggest a monstrosity. It is worth growing wherever there is water—if only a little.

There is a semi-double form which is sometimes found in gardens under the name *semiplena*, and occasionally growing wild. It is properly called *C. palustris plurisepala* as HUTH named it in 1892, but as it is much less double than *C. palustris plena* it is less worth growing. This plant should not be confused with the noble *Caltha polypetala* from the Orient or *C. palustris polypetala* from Bulgaria, Caucasus, Transcaucasus, Kurdistan, Armenia, and Persia.

121. SYRINGA VULGARIS 'MASSÉNA.'

Award of Garden Merit, July 28, 1930.

The habit of growth, hardiness, and general value of the Lilacs call for no comment. They do not need recommendation, but the vast number of varieties calls for the exercise of selection on the part of the planter. Two varieties have, so far, been given the Award of Garden Merit, not because they are necessarily the best in cultivation but because they are good, easily procurable, and sure to please if given ordinary good cultivation.

To do well, Lilacs need a mulch of rotted manure every year or two, in autumn or in early spring; they need a sweet soil and are the better for occasional dressings of powdered chalk; they need little pruning, but should have all the dead flowers removed as soon as possible and at the same time all weak shoots; and especially is it important to remove all suckers. It should be remembered, too, that Lilacs attain a large size eventually, and so allow room for development when planting them.

Lilacs are subject to few diseases, but occasionally a bacterial disease attacks them and causes the death of some of the foliage in summer. Unless it be attended to, it is apt to spread and not only disfigure the bush but also destroy its symmetry. The treatment is merely to cut out the affected shoots below the point of attack and burn them.

Syringa 'Masséna' forms large upright trusses of very deep purple-red single flowers, each about an inch across. It was raised by Messrs. V. Lemoine & Son of Nancy and introduced about ten years ago.

122. SYRINGA VULGARIS 'SOUVENIR DE L. SPÄTH.'

Award of Garden Merit, July 28, 1930.

Syringa 'Souvenir de L. Späth' has good trusses 10 inches or so long of single deep purple flowers. Though sent out many years ago it holds its own as perhaps the best variety of its colour.

This fine variety was raised by Messrs. Späth of Berlin and introduced by them in 1883 under the name of 'Andenken an Ludwig Späth.' For some reason it is almost invariably called in this country 'Souvenir de Louis Späth' and we hope this note may do something to restore the correct rendering of the name, for there seems no reason to translate a personal name even if "Andenken" be translated.

TRACHYCARPUS FORTUNEI.

MRS. F. C. KING-CHURCH, of Highmead, Alton, Hants, has sent us large inflorescences and equally large bunches of fruit of this hardy palm, and now sends us the photograph which we reproduce in fig. III of the tree which produced them in her garden.

The tree was planted by Mrs. ADDERLY eighteen years ago, having first been grown in the Palm Court of a house in the Meon Valley. At first it was protected by tying sacking around it in winter, but latterly no protection has been given, although the garden is 600 feet above sea level, and severe snowstorms have covered it. Two others in the same garden have both flowered and are taller than this. The tree illustrated, which is about 6 feet high and 7 feet across, has flowered three years in succession.

The Chusan palm, *Trachycarpus Fortunei*, was introduced by SIEBOLD when just a hundred years ago he sent seeds from Japan to Leiden, but few trees resulted. Then ROBERT FORTUNE sent home seeds when collecting for our Society in China in 1849. Experiments were made with some of the seedlings raised from these seeds and the hardiness of this palm was then ascertained. The above note, however, indicates a point of importance in its cultivation. It needs protection in its early growth. When really well established it will withstand much cold with little injury and form an interesting and handsome object in almost any garden.

It is often called *Chamaerops excelsa* or *C. Fortunei*, and under the name *C. Fortunei* it was figured in *Bot. Mag.* t. 5221.



FIG. III.—*TRACHYCARPUS FORTUNEI* NEAR ALTON, HANTS.

[To face p. 280.]

BOOK REVIEWS.

"Memoirs of Travel, Sport, and Natural History." By the late Henry John Elwes, F.R.S. Edited by Edward G. Hawke, M.A., F.R.G.S. With an Introduction by Sir Herbert Maxwell, and a Chapter on Gardening by E. A. Bowles. 8vo. 317 pp. (Benn, London, 1930.) 21s.

Comparatively few personal Memoirs appeal to a wide circle of readers, and many of the modern books of travel are merely expanded railway guides written by anyone who can afford a journey to well-known parts of the world.

The Memoirs of Henry Elwes are in a very different category. They are in the main a record of journeys to many little-known parts of the world undertaken by a scientific naturalist of unflagging energy with wonderful powers of observation. Almost every page contains matter of great interest to the botanist, ornithologist, entomologist, or sportsman, and the reader marvels how any man could have done such a vast amount of collecting and then had time to work out his collections for scientific classification.

Few men have possessed such wide and accurate knowledge in so many different branches of natural history, coupled with such great interest in horticulture and arboriculture. Moreover, he attended closely to the management of his farms and his duties as a large landowner, and the chapters in his "Memoirs on Rural Life and Farming on the Cotswolds" should be read by everyone who professes an interest in the life of Rural England.

These Memoirs form a delightful record of the life and work of a naturalist who added largely to our knowledge of birds, insects and plants. Not the least interesting pages of this book are those containing the list of plants from his garden which have been figured in the *Botanical Magazine*. His name too must always recall that wonderful work, "The Trees of Great Britain," and those who read these Memoirs can realize how exceptionally fitted Henry Elwes was to undertake that monumental publication.

His journeys in search of birds, insects and plants took him to Sikkim, Asia Minor, Mexico, Japan, and Formosa. He was not merely a wealthy globe-trotter wending his way from one large city or good hotel to a similar halting-place, but a collecting naturalist and man of the world who went as far from the beaten track as time and circumstances would allow. He was a worthy successor to men like Douglas, Lobb, and Fortescue, and though his various journeys did not yield such masses of new species as those of Wilson, Farrer, and Forrest, still many of his introductions figure in English gardens to-day.

The reader can only marvel at the energy and enthusiasm of Elwes as revealed in every page. The work he did might well have given

full-time employment to a keen botanist as well as to an ornithologist and lepidopterist. When the first of the journeys was undertaken the world was a very different place from what it is to-day, and no doubt fifty years ago there was more scope for a man like Elwes to make his mark, but no one can say that he did not take full advantage of his opportunities.

Some readers of the Memoirs may complain that they are merely a catalogue of scientific names of no interest except to specialists in certain branches of natural history. That would be a narrow and utterly wrong point of view, for these are the memoirs of a man of many attainments and give the picture of a life work that can hardly be accomplished nowadays. The world is too old and too well known, and men of the type of Henry Elwes are rapidly disappearing.

The editor has done his work well. Where the personal narrative is missing the sources of information have been found and used. The reader has not continually to take his attention from the text to foot-notes and references with the consequent loss of interest in the story. The few errors are trivial. The book should certainly be read not only by those interested in natural history, but by all who want a vivid picture of an energetic and much varied life.

“Notes on Tulip Species.” By the late W. R. Dykes. Edited and illustrated by E. Katherine Dykes. 4to. 108 pp. with 54 plates. (Herbert Jenkins, London, 1930.) £8 8s. net.

Any work of W. R. Dykes needs no introduction to members of the Royal Horticultural Society. It is well known that for some years before his death he had been collecting material for a revision of the genus *Tulipa*. He was growing all the species he could obtain in the trade and from collectors, and was making various cross-fertilizations in order to throw light on relationships and specific identities. Dykes had in view a monograph comparable to his fine Iris book, and to that end Mrs. Dykes was from year to year making coloured drawings of the type species as they flowered. It is her beautiful drawings, 54 in number, which are reproduced in the book before us, together with such information as could be put together from the notes left by Dykes. The result is incomplete; the tale of drawings includes but a portion of the range of species Dykes was growing, and the notes which embody his examinations of the herbaria at Kew, the British Museum, and Edinburgh, were only the beginnings of the full study he had planned, and were in no sense ready for publication. But it is right they should have thus been preserved; not only are the drawings likely to become the classical illustrations of certain types, but the notes are necessary to the work of whatever investigator will eventually take up Dykes's task and complete the review of this difficult genus. There are points on which Dykes's conclusions are likely to be revised, because he died before the cytological work of Newton, whose interest he had excited, had

provided the most important clue to the taxonomy of the genus. For example, the book includes three drawings of *T. sylvestris*, and the notes deal with *sylvestris*, *patens*, and *Celsiana*. Newton demonstrated that the typical *sylvestris* is a tetraploid that we must presume has arisen from a doubled cell of *australis*, and as this accident may well have occurred independently at different times and places the slightly different types of *sylvestris* would be accounted for. But *sylvestris* and *australis* have often been confused; indeed, I surmise from the drawing that Dykes's "*sylvestris* from Mount Athos" may be an *australis* form. As for *Celsiana*, Dykes's note says "a small single-flowered *biflora*," but a further quotation describes the flower as yellow. The *Celsiana* of commerce is only a synonym of *australis*, i.e. yellow-flowered, and this agrees with the beautiful drawing in Redouté. The status of these two species is an interesting problem. *T. sylvestris* is abundant in vineyards, etc., in northern Italy and southern France, in Switzerland and Germany, and in a few places in England and even in Sweden, but it is almost certainly an introduced plant. *T. australis* belongs to the hills and may be truly wild in the Apennines, in the Cevennes, and in Spain and Portugal, since it may have extended from its focus in Asia Minor along the northern shores of the Mediterranean, as on the other side it extends into Algeria. The odd thing is that it occurs in no enumeration of European plants prior to the latter half of the sixteenth century, so that even its status is doubtful.

One point of considerable interest is Dykes's conclusion to merge the three species distinguished as *linifolia*, *Maximowiczii*, and *Batalinii*. The first two are scarlet, the last a pure yellow, but Dykes found they crossed freely and the seedlings are intermediates, showing every shade of buff and apricot and ranging almost from one parent to the other. Similarly the blotch so characteristic of the scarlet forms appears as an olive stain in the buff forms, gradually deepening in intensity as the colour of the seedling approaches scarlet. In other morphological characters the three "species" differ no more than do individuals within the same group. With Tulips there is perhaps more justification for the policy of "lumping" than with most plants, because the persistence of individual variations as clones must delay the process of unifying to a type by natural selection. For this species Dykes revives the old name *montana*, which is now generally applied to a different Tulip, the common red Tulip of the nearer East—Asia Minor, Palestine, Syria, etc.—whereas the plant under consideration belongs rather to Persia, Bokhara, and Afghanistan. Dykes's authority is the figure of a Tulip, to which Lindley first gave the name *montana*, in the *Botanical Register* for 1827, but it must be admitted that the description there is not very convincing.

Mrs. Dykes's drawings include the typical form of *T. Chusiana* and also the strange dwarf form with undulate leaves from Thibet. Of this latter only the one bulb is known and it is being very carefully cared for in the collection of the John Innes Horticultural Institution.

Its history is lost and we do not know how or whence it reached Dykes. Its extreme interest lies in the fact that it is a normal diploid, whereas the type *Clusiana* is a pentaploid, the only one known among Tulips. The interest is extended by the fact that another form of *Clusiana*, which came from Chitral and is sometimes known as *chitralensis*, turns out to be the tetraploid of the group. It is to be hoped that some more bulbs of the unique Thibet form can be found; if ever it could be ascertained who gave the bulb to Dykes and from what locality it came, there would be more hope of tracking it. It must be the starting-point of the typical *Clusiana* which belongs to Persia, Afghanistan, and perhaps further west in Asia Minor. It occurs in Italy, southern France, Savoy, and Spain, but almost certainly as an escape from cultivation, which agrees with its stolon-forming habit and its inability, as far as has been observed, to set seed.

As to the *montana* of gardens there is confusion yet to be cleared up between *oculis-solis*, *cuspidata*, and *lanata*; equally *T. Gesneriana* Linn. is a complex of which it is doubtful which are the truly wild representatives. But problems of this kind abound in the genus *Tulipa* and can only be resolved after genetic and cytological study upon the living material. This latter has become very difficult to obtain since the war because the habitats of the genus in south-western Asia are practically closed to travellers. The notes in the book include a few hints on the cultivation of these Tulip species, many of which are not so much fastidious as given to dying out unaccountably. In their homes they are locked up in bitter cold for a long winter and then experience a prolonged baking after their flowering, and our changeable climate does not afford them the rest they need. More experience is needed of planting at depth, even down to a foot below the surface. Many garden Tulips respond gratefully to this treatment, and every traveller who brings home the bulbs tells of the depth to which he had to dig.

Incomplete as Mrs. Dykes's book must be, it remains a noble memorial to her husband. The printing, paper, and the plates are all of superb quality, and the book may worthily take its place in the library alongside some of the other classic delineations of flowers.

"Dykes on Irises: A Reprint of the contributions of the late W. R. Dykes, L. ès L., to various journals and periodicals during the last twenty years of his life." Com. and ed. by G. Dillistone. viii + 294 pp. (Iris Society, London, 1930.) 12s. 6d.

No one studied Irises so intensely, no one brought such acumen to bear upon their study, and no one wrote so fully, so forcibly, or so convincingly upon Irises than the late Secretary of our Society, Mr. W. R. Dykes.

Some of his articles are readily accessible, like those in our JOURNAL; others are scattered in daily and weekly periodicals and are not so easy to find and peruse; and it was a happy thought of the Iris Society to arrange for the collection and reprinting of these scattered articles

and notes in a readily accessible form. The work of gathering and editing such a collection cannot have been a light one, and Mr. George Dillistone and his helpers, Messrs. G. P. Baker, G. Yeld, and F. W. Hellings, upon whom the task lay, must be congratulated upon bringing it to a successful conclusion.

The articles are arranged usually according to subject, general articles coming first, then those dealing with species, and lastly miscellaneous notes. The notes on species have been arranged alphabetically, and this is doubtless convenient, but in one place at least it has led to an incongruity where the note under the heading *I. Clarkei* precedes by several pages that on *I. himalaica* which it was intended to correct.

The compilation is increased in value by the very full index, occupying twelve pages, with which it is terminated, so that the twenty or so occasions that call for mention of the name of an Iris can be easily found, and all that Mr. Dykes (outside his formal books) wrote of any Iris can quickly be discovered and digested.

A good number of illustrations are scattered through the book, but it is not clear whether these were used to illustrate the articles in the first instance, or whether they have been added since. They are rarely in juxtaposition to the species described, and unfortunately they are not referred to either in the index or in the text, though there is a reference on each to some remark in the text.

The book is a compendium of the ideas of its author, clearly written, interestingly expressed, and well reproduced, and one such as none of those really interested in the genus will, we are sure, dispense with from their library, however small it be.

"Alpine Flowers. The most common Alpine Plants of Switzerland, Austria, and Bavaria." By Dr. Gustav Hegi. Authorized translation by Winifred M. Deans, M.A., B.Sc. 8vo. 74 pp. (Blackie & Son, London, 1930.) 7s. 6d. net.

This is a most excellent book for the tourist, the rock gardener, or the flower lover. In it are illustrated (mostly in colour) over 250 of the Alpine flowers most commonly found in the Swiss and neighbouring Alps. The coloured illustrations are delightful—lithographic, I think—and in addition to being excellent portraits and a genuine help to the amateur who wishes to identify his finds, they have a rich glossy old-world charm that recalls the fine Christmas cards which were in vogue forty and fifty years ago. The little line engravings, too, at the end of the book, are good, whilst the half-dozen photographic illustrations which follow them make up for what they lack in charm, with clearness, likeness, and usefulness. The text, too, is helpful without being unnecessarily technical. Besides the scientific Latin names, the local popular names current in the districts which the various plants inhabit are given, and to the descriptions are often added odds and ends of local information, medicinal uses, and so forth, which are often of very great interest. The book is well printed, well bound, and well indexed, and there is a useful glossary of botanical terms. A book to possess and to take with one to the Alps, for, though it does not give all the flowers you may find, it gives a surprising number, and gives them well, in a very portable form.

"Our Wild Orchids, Trails and Portraits." By Frank Morris and Edward A. Eames. La. 8vo. xxxi + 450 pp. 130 full-page illustrations. (Chas. Scribner's Sons, New York, 1930.) \$7.50 (30s.).

This book has been written to fill the need the authors felt when they began their quest of Orchids fifteen years ago, and it is intended first of all for amateurs who are lovers of outdoor life and the world of nature. The seventy-two Orchids

concerned are natives of the north-eastern United States of America and Canada, west to Minnesota and north to Tennessee. In nearly every case each of these species is represented by two reproduced photographs, one showing the flowering plant in its natural setting of bog, thicket, or meadow, and the other a close-up view that enables the details of the individual flowers to be better discerned. The Orchids described are grouped in four tribes, viz. *Cypripediaceae*, *Ophrydaceae*, *Neottieae*, and *Epidendreae*, with a key to the genera.

Each of the seventy-two Orchid trails made by the authors is the subject of a separate article. In each of these are recorded all the popular and technical names, descriptions of native haunts, lists of plant companions, and notes of range and season. The foreword is by Professor Oakes Ames, of Harvard University, while at the end are a glossary of technical terms and indexes to the Latin and common names.

"Landscaping the Home Grounds." By Leonidas W. Ramsey. 8vo. 168 pp. (The Macmillan Co., New York, 1930.) 8s. 6d. net.

The purpose of this book is to supply owners of small gardens with a volume which in simple terms shows them how to lay out their grounds to best advantage.

Although primarily intended for the American public, it will be found of considerable interest and value to amateur gardeners in this country, where, in spite of the high standard of horticulture, the principles of garden planning are so little understood.

Included in this volume are well-illustrated and informative chapters dealing with the location of the house, the arrangement of walks and drives, and the planning of the pleasure garden, as well as practical instructions as to drainage, the formation of lawns and walks, and the building of garden pools, which, except in a few minor details, are equally applicable in this country.

The least valuable portions of the book to the English amateur are those concerned with planting, and the American practice of planting large trees and shrubs in the immediate vicinity of the house is not one to be followed. In formal and common-sense planning, however, this work gives some very sound advice and, if followed, should prevent many of the mistakes which the amateur landscape architect is so liable to make.

"Growing Trees and Small Fruits." By H. B. Knapp and E. C. Auchter. 8vo. 510 pp. (John Wiley, New York; Chapman & Hall, London, 1929.) 15s.

In the preface it is stated that "This book is intended to meet the needs of schools and departments of Vocational Agriculture. Since these agencies are concerned primarily with the practical phases of fruit growing, it follows that this book, if it achieves its purpose, should also be useful to those who are actually engaged in growing fruit." It is seen, therefore, that the authors are primarily concerned with practice. They deal with the theoretical considerations more fully in their larger book, "Orchard and Small Fruit Culture."

The earlier chapters treat of the modern American methods of harvesting, storing, and packing for market the more common fruits, the later with cultural operations and orchard management.

Some idea of the authors' methods may be obtained from the following. The important subject of "how to identify varieties of fruit" is dismissed in the course of two brief pages. Much more space is devoted to the dodges and tricks of filling a barrel of apples so as to make it appear attractive when opened. It is only somewhat reassuring to read that "These 'facers' are the apples that are to form the first layer or plate in the barrel. They should be fairly representative of the whole barrel, uniform as to size and colour in order to fit well and make the face look as attractive as possible when the barrel is opened." But we hope such are not the educational methods in general vogue.

The book is profusely illustrated; although some of the illustrations of apparatus employed in spraying, as for example fig. 104, are not sufficiently clearly annotated. The student is recommended to obtain much information from the growers in his own locality, and the questions and exercises to be found at the ends of the chapters are designed with the intent and purpose of aiding him in so doing.

Naturally, in a book of this character, much of the information is inapplicable to European conditions, and, of course, the growing of cordons or dwarf bushes, and the influence of rootstocks on the growth, receive inadequate or no treatment. The grower who desires to read of American spraying, packing, and marketing methods will find this a handy source of information.

"Everyman's Encyclopædia of Gardening." By W. P. Wright. New ed. 8vo. xvi + 495 pp. (Dent, London, 1930.) 6s. net.

This is, as books go nowadays, a remarkably cheap book. Well printed on good but not heavy paper, in small but clear type, all its pages are filled with useful information. While now and then the printer has slipped and given us, e.g. on p. 109, *Fricaceae* for *Ericaceae*; and now and then the author, who tells us that *Androsace Chumbyi* resembles *A. sarmentosa* (p. 22), or that *Eschscholzia* is spelt *Eschscholtzia* (p. 151), in which he errs in a numerous company; such slips are few and far between, and generally quite obvious.

The plan of the book is this: first comes the name of a genus (or a subject) with, if any, its English equivalent, and sometimes (as with *Sanguinaria* where Paccoon is given) a foreign one as well; then the pronunciation, so that its readers need no longer offend the ear when rendering, e.g. *Camellia* (generally well done); and the natural order to which the plant belongs; then some notes on the species, and their garden use, their propagation and general treatment, with soils proper for their well-doing and fertilizers to use in them.

It would be too much to expect that within so moderate a space all the plants grown in British gardens could be dealt with, but as a rule the selection is excellent. Perhaps the least up-to-date selections are noticed among trees, for we do not find that excellent Cherry, *Prunus yedoensis*, nor 'Apple-blossom'; nor *Pyrus purpurea*, or *P. Eleyi*. The lists of herbaceous plants and rock plants contain enough to satisfy most owners of gardens; and those who seek more will soon find that no one book will cater for all their wants, while this gives much more than most.

"Australian Nature Studies." By J. A. Leach. 8vo. 525 pp. (Macmillan, Melbourne, 1929.) 12s. 6d.

The author, "having had unusual opportunities and experience in nature study as teacher, lecturer, organizer, and inspector, in addition to a wide field acquaintance with Australian fauna, flora, and natural features, offers this volume as an Australian contribution towards the development of a subject that has assisted in bringing reality into schools and interest into the lives of many children as well as adults."

Educationists have often debated the relative merits and demerits of the severely classical education enjoyed (or endured) by all pupils under the old regime. Perhaps many garden lovers will feel that the more modern tendency to present the facts of Nature to the young is one that is to be encouraged.

Although designed for boys and girls and consequently free from technical terms, this book will attract older readers, as it deals simply with the flora and fauna of the Commonwealth. Unfortunately for young readers the book suffers from its condensed form, and many of the illustrations—there are 189 plates, each with more than a dozen drawings—will fail to attract the attention of the reader, simply because they have had to be crowded together. Teachers and others concerned will find a chart of subjects covering a period of eight years' work from the very early age of six upwards.

"Saturday in My Garden." By F. H. Farthing. Ed. 8. Rev. by A. C. Bartlett. 8vo. 484 pp. (Richards Press, Ltd., London, 1930.) 7s. 6d. net.

To reach its eighth edition since 1911 speaks well for a book, and indeed this deserves its popularity, for the information it gives is accurate and it is helpful, for it deals with a great diversity of such subjects as confront the amateur gardener, in a clear and concise way. The author, the late Mr. Farthing, was a journalist, and had the faculty of conveying information lucidly and well, so as clearly to be apprehended. If recommendation is needed, we can heartily recommend this book.

"The Proteases of Plants." A Record and a Reply. By S. H. Vines. F.R.S. (Macmillan, London, 1930.) Price 1s.

Experiments carried out during 1897 to 1910 led the author of this little monograph to conclude that there are two enzymes of frequent occurrence in plants which accelerate the digestion of proteins. By their aid the complex proteins are more easily hydrolysed, to give simple proteins such as the albuminoses and peptones; and on further hydrolysis these water-soluble proteins yield amino-acids.

"The point discussed in the present publication is whether these two processes of digestion are effected by one and the same enzyme or whether each is

effected by a distinct enzyme." Professor Wilstatter and his associates uphold the former view, whilst the author maintains that there are two distinct enzymes, each limited in its action to one part of the process of hydrolysis. One enzyme, of animal origin, trypsin, undoubtedly accelerates the production of amino-acids and similar compounds from complex protein materials, that is, it facilitates the entire process of digestion. In extracts from plants there is experimental evidence, obtained by employing various antiseptics, which indicates that one stage of the hydrolysis can be checked whilst the other is not, and this is regarded by the author as indicating that there may be two enzymes.

This problem can only be settled by further careful experiments, and before finality is reached we may have to wait patiently for the time when any enzyme can be isolated "chemically pure"—if their nature is such as ever to permit this complete isolation; for many enzymes can only with great difficulty be partially separated from the living protoplasm, but others are obtained more easily as extracts.

"Growth and Tropic Measurements of Plants." By Sir J. C. Bose. 8vo. 448 pp. (Longmans, Green & Co., London, 1929.) £1 1s. net.

This book forms a companion volume to "The Motor Mechanism of Plants," a review of which appeared in this JOURNAL, September 1929. The author continues the description of his experiments.

The reader's admiration is again evoked for the apparatus employed; again readers are transported to a world of micromasurements in which they are complete strangers, and are astonished, or even amazed perhaps, to find that the author records that he has been able to detect the influences of disturbances in space, similar to "wireless waves," upon the growth of wheat seedlings.

Throughout, the text is profusely illustrated by diagrams and charts made by the automatic recording apparatus, which enable the reader to judge the magnitude of the measurements.

Perhaps some philanthropist interested in plants from such a view-point will some day present to other workers the opportunity of confirming the work of the Bose Institute by ensuring the provision of all necessary apparatus.

"Practical Botany." By Prof. A. H. R. Buller. 8vo. viii + 275 pp. (Longmans, Green & Co., London, 1929.)

This useful book for an elementary botanical student, provided with the material referred to, and with the aid of a competent teacher, will go far towards giving him acquaintance with the main facts of structural botany. It was prepared by the author for the use of his own students and as a guide to them, not as a spoon to feed them with facts, but as all good students' books should be, something to help them to discover facts for themselves. To this end illustrations, with the solitary exception of annotated sketches of the microscope, are entirely omitted, and this is as it should be. As it was prepared with a special eye to the conditions and materials available at Winnipeg it would necessarily require modification in some degree for use in other districts, but with this proviso we can very heartily commend it to any teacher for its suggestiveness.

"Flowers and Trees of Palestine." By Augusta A. Temple. 8vo. xii + 148 pp., with 30 coloured illustrations. (Society for Promoting Christian Knowledge, London, 1929.) 6s. net.

This new edition, being half the size of the older one, is even more portable. Also it gains in value by the substitution of thirty excellent, though small, coloured plates for the forty photographic illustrations. The text and alphabetical list of plants have been very little changed. A few paragraphs have been added to the chapter on Trees. Instead of the plaint that no forest conservancy existed and therefore trees were being destroyed for firewood, it is good to read the accounts of reforestation now in progress. A few errors and misprints reappear in the new edition. The 'Rose of Jericho,' *Anastatica hierochuntica*, has been confused with the 'Resurrection Club Moss,' *Selaginella lepidophylla*, found from Texas to Peru and frequently imported to England as a vegetable curiosity. Both plants roll into a ball when dry and are driven about by wind, opening out again if soaked in water. *Anastatica* has rather large spatulate leaves more like those of a wallflower than a *Lycopodium* as stated.

The Orange Crocus found near Tyre is more likely to be *vitellinus* or *ancyrensis* than *aureus*. The Mandrake of Syria has greenish-white flowers, not blue like those of *M. autumnalis*; *Andropogon* should be *Andropogon* and lacks the "c"

in its specific name *Schoenanthus* in the text. *Iris Vartini* should be *Vartani*. These are only minor blemishes, however, and no one wishing to learn something of the rich flora of Palestine could find a more helpful pocket guide than this book.

"New Views of Evolution." By G. P. Conger. ix + 235 pp. (Macmillan, New York, 1929.) 10s. 6d. net.

This is a running commentary on various views of evolution.

"Botany. A Text-Book for College and University Students." By William J. Robbins and Harold W. Rickett. 8vo. 535 pp. (Macmillan, London, 1929.) 16s.

Teachers of University classes in Botany, as in other subjects, are from time to time compelled to design new textbooks primarily to meet the requirements of their own departments. The comparatively recent enlargement of the University system, together with the continued growth of Botany, has greatly increased the range of standard texts available, so that junior students must often be somewhat embarrassed by the number. The present volume comes from the Wisconsin School of Botany; in it the authors "attempt to present the fundamental biological principles," rather than to lay the foundations for a professional training, "believing that many of their students receive no other formal instruction in the biological sciences." In consequence, the authors set out to describe the methods and also the limitations of their subject.

The first ten chapters cover familiar ground in that they deal with the structure and function of the flowering plant. Here the text is profusely illustrated with new and old diagrams and photomicrographs, many of which are particularly clear.

The novel part of the book contains those chapters dealing with such general topics as "Life and Death" and "The Origin of Life." In this section Teleology, that unsubstantiated idea (unfortunately so often expressed in Horticultural literature) that the plant reacts to a stimulus, or given set of conditions, in order to thrive or benefit by the reaction, as if it were a conscious reasoning organism—such a view is here dealt with in no uncertain manner. In how many of our older textbooks do we find "Pharaoh's serpents" described to show the difference between chemical change and physiological growth? This section of the book is written in a forceful and vigorous style; it is to be hoped that the brilliance of the examples quoted in illustration of the principles will not cause the principles to receive less attention from the student than they themselves deserve.

About one-third of the text deals with flowerless plants, the life cycles of which are frequently illustrated by diagrams more usually constructed by the students themselves. Questions are provided for revision and discussion of the subject-matter of each chapter.

"How to Grow Roses." By Robert Ryle, J. H. McFarland, and G. A. Stevens. 17th Edn. 8vo. 210 pp., and numerous illustrations. (Macmillan, New York, 1930.) 8s. 6d. net.

This little book has been prepared for American rosarians by three gentlemen, the first of whom is the secretary, and the second the president, of the American Rose Society, and the editor of its Annual. It may be regarded, therefore, as a publication of some authority in the country of its origin; and as such by no means devoid of interest for growers in other countries.

It is a general rule that the best and most popular Roses in this country prove before long to become such in nearly all our Colonies and Dominions, as well as other countries the world over, but to this rule the United States of America has often seemed a curious exception, Roses which have attained a great name over there having often proved a failure in this country, while those in which we have here felt some little pride have, when taken to America, sometimes met with a reception which has not always accorded with our expectations.

Quite early in the volume before us we find a sketch map of the United States, shaded so as to show the areas suitable for growing different kinds of Roses out of doors. The area recommended for Tea Roses is confined to a comparatively small portion of the south, extending narrowly up the eastern and western coasts, where doubtless the influence of the sea is felt. Behind this, extending inland, is a further area, not greatly differing in size from the first, in which H.T.s are considered hardy; but over the greater part of the States it seems they can only be grown with protection; while in the more mountainous

districts of the west and in the north we are told that only the hardiest Roses will thrive.

This little map throws much light on the difference between the United States and this country, where even in the extreme north of Scotland the H.T. will flourish with little more care than in the south and west. It explains the careful directions given for wintering Roses by elaborate systems of earthing up and laying in the shoots, as well as the well-known devotion of American nurserymen to Roses under glass.

Hence we find the selections of Roses for special districts dealt with at some length, and a large number of lists prepared by residents in various districts are supplied. In those coming from the Pacific and Atlantic coasts and the Rocky Mountain States we find lists which, with slight variation, include H.T.s, both climbers and dwarfs, and other climbing varieties such as might be commonly met with in this country, while in the lists from the "Central, West and North" only the hardiest Roses appear, such as the Rugosas and many of M. Jules Graveraux's hybrids of that species: 'Belle Pontevine,' 'Roseaie de l'Hay,' and others, which, from the lack of finish and form in the flower, are seldom exhibited in this country, but have evidently been found of value in situations where hardiness of constitution is the determining factor. It is only in the lists from the South Atlantic coast that we find the Tea Roses mentioned, and there they seem to take a higher place than is commonly the case in this country.

Coming from so authoritative a source these select lists are of considerable interest. 'Radiance' and 'Red Radiance' have a place in a large proportion of the lists and have evidently attained a popularity in America which they failed to attain in this country.

The growing of Roses on their own roots has never attained much following in this country, and probably few, if any, nurserymen make a practice of selling "own root" Roses, *i.e.* plants raised from cuttings, those budded on some free-rooting stock being generally preferred. It seems to be otherwise in America, and the authors discuss the question at some length, but find that it is only south of Washington that own root Roses will persist, "and sometimes two years of additional growth must ensue before the resulting plant is as vigorous as the average commercial budded rose plant."

It is no doubt generally desirable to obtain the wild species on their own roots, so as to avoid difficulty with suckers; but with this exception our experience in this country accords with that of our authors.

"The Structure and Life of Forest Trees." By Dr. M. Büsgen: third revised and enlarged edition by Dr. E. Münch. English Translation by Thomas Thomson, M.A. 8vo. xi + 436 pp., 173 figures. (Chapman & Hall, London, 1929.) Price 30s. net.

Ever since Büsgen's "*Bau und Leben unserer Waldbäume*" appeared in 1897 it has been the most important textbook on the structure and physiology of forest trees. The author died in 1921, and in 1926 the third edition was edited, and in part rewritten, by Professor Münch of Tharandt. It is this edition which has now been translated by Mr. Thomson.

The publication of the book in English is likely to prove a landmark in the history of the training of forestry students. For Büsgen's work bridges the gulf, which has often been unduly wide, between the preliminary training in "pure" botany and its application in the practical science of silviculture. In the courses in elementary botany in our universities the structure of trees is generally taught in an adequate manner, but plant physiology is treated in a very general way, and, since experiments are usually carried out on herbs, instruction in physiology has usually no special application to the crops that foresters are called upon to grow. It is consequently the physiological part of Büsgen's work, the *Leben* rather than the *Bau*, which will most interest the English reader.

The interesting nature of the book will become apparent from an enumeration of a few of the subjects with which it deals. When does stem elongation start and finish? What is the relation of cambial activity to stem growth? Under what conditions do epicormic shoots appear? What are the greatest heights recorded for various species? What relationship can be found between the structure of timber and its strength? How does a wood compare with a field in respect to its demands on the mineral salts in the soil? These questions belong to a class which the forester is always asking and the "pure" botanist is seldom able to answer.

It is mostly for information of this nature that the book will be read. And it will be of interest not only to the teachers and students of forestry, but to all

who are engaged in the cultivation of trees. Those who have received no botanical training may have to skip certain sections—the minute structure of plants can never be learnt from books without personal observation with a microscope—but they should not refuse to read the book on this account, since its perusal will yield them a rich fund of interest.

Perhaps every textbook is out of date before it is published, and this one is not an exception to the rule. It is clear that the author was unable to read English, and the only English papers referred to are those which have previously been quoted in German books. For this reason many sections, especially those on the growth in height and thickness in trees, are very incomplete. Also, statistical theory and the critical examination of the significance of experimental results are advances which have been made chiefly by the English-speaking scientists, and such analysis has shown that many of the conclusions drawn from the older experiments are invalid. Nevertheless, these experiments are quoted by Büsgen as convincing evidence.

The final chapter on "Local Races," which was added by Münch to the third edition, is an exceedingly interesting essay on a subject the importance of which is being more and more widely appreciated.

Mr. Thomson has placed all foresters and arboriculturists in his debt by completing the laborious task of translation. The English is very clear, and the reader is seldom conscious that he is not dealing with a book in its original language. The illustrations are well reproduced, and the book is attractively got up, though it would have been more comfortable to read if lighter in weight, and more available to students if cheaper in price. The printer's errors are rather numerous.

"Gnetales." By the late H. H. W. Pearson. 194 pp., 4 plates, 90 figures. (Cambridge University Press, 1929.) 18s.

This highly welcome work on the Gnetales by the late H. H. W. Pearson, well known for his travels in South-West Africa and his researches on *Welwitschia*, is edited by Professor Seward, assisted by Mrs. D. Thoday. The work includes chapters on Habit, Distribution, Ecology, and Taxonomy; Vegetative Morphology and Anatomy; The Inflorescence and Flower; Reproduction; and a theoretical chapter. There are four excellent plates, including the frontispiece, which is a photograph of the author. The many figures throughout the text are clear and very helpful, as are also several Tables of Comparison. In his preface the editor points out that "in view of the importance of Professor Pearson's researches it was decided to publish, with as little alteration as possible, such parts of the manuscript as seemed to be in their final form. Sections interpolated by Mrs. Thoday are enclosed in square brackets."

"Commercial Tomato Culture." By J. W. Craig. Ed. 3. 8vo. 48 pp. (Benn Bros., London, 1929.) 2s. 6d. Paper covers.

The contents of this new edition of a most useful little book are not materially different from those of the first edition published in 1924.

"Forests and Mankind." By C. L. Pack and T. Gill. 8vo. 250 pp. (The Macmillan Company, New York, 1929.) 12s. 6d.

The principal object before the authors of this American book is to bring home as vividly as possible to their countrymen the fact that they are within measurable distance of bankruptcy in the matter of timber supplies.

The book is well and tersely written and comprises in its 250 pages 21 short, readable chapters on all aspects of forestry practice. There are 24 illustrations of trees and forestry operations and more than that number of highly instructive and suggestive diagrams, as well as some half-dozen maps of the United States, indicating present and past forest areas. The book does not pretend to be an exhaustive scientific treatise of the subject for the use of the professional forestry student, but its purpose is to invoke a realization of the imminent need of increased private and governmental effort towards the conservation of the woodlands that are still left. Of the 800 million acres of timber which it is estimated the country originally contained, only 17 per cent. is now uncut. The effort at re-forestation by actual planting has so far amounted to one and a half million acres, and the authors give us the shattering information that "each year we plant about the same area that the lumber industry cuts over in scarcely more than four days." One is tempted to quote a few of the extremely pithy and arresting sentences which occur in almost every page and remain in the mind:—

"Chlorophyll is the most important substance in the world, for practically all food is based on its presence in green leaves."

"Mexico once possessed extensive forests and an Indian civilization flourished there, which before it disappeared from the earth deforested millions of acres of woodlands."

"All nations approach forestry with reluctance and only when impelled by necessity."

"One Sunday edition of a big city newspaper alone requires the timber on eighty acres of forest to produce one edition of its paper."

"The people of the United States consume more than eight million tons of paper a year—more than all the other countries of the world combined."

"It requires no gift of prophecy to tell which way a man is heading who spends five times his income. So far as our forest income is concerned we Americans typify that man."

Since the demolition of White Pine (*Pinus Strobus*) and Red Spruce (*Picea rubra*) of the North-Eastern and Northern States, America came to rely for its principal soft-wood supplies on the Pitch Pines (*Pinus palustris* and *P. taeda*), Slash Pine (*Pinus Caribaea*) and Short-leaved Pine (*Pinus mitis*) of the South-East. These in turn have been so greatly diminished in the last twenty-five years that the coniferous forests of the Pacific Coast are now the last great reservoir left to drain. Indeed the trees of California, Oregon and Washington are being exploited so fast that the end is almost coming into sight. To-day these three States contain about half of the available soft-wood timber in the United States. The timber content of such Eastern States as Pennsylvania, New York and Michigan has long ago become insignificant.

The authors argue very cogently for the need of increased fire-protective measures. The practice of forestry in the United States is still largely confined to the organization of such protection. In spite, however, of what has already been accomplished by Federal and State support in this direction, it is melancholy to read that fire losses are still increasing. It is, of course, true that forest fires caused by lightning have taken place throughout the ages, which is proved by the healed scars hundreds of years old to be seen in a section of Sequoia; or in the fact, not mentioned by the authors, that certain coniferous species require that their cones be baked before they will open and release the seed; trees comprising a forest of *Pinus muricata* are in consequence all of the same year of germination. But we read that to-day only 2 per cent. of the forest fires of America can be attributed to lightning and the rest are intentionally or carelessly started by the hand of man.

Other forms of waste are adequately dealt with and the importance of economizing the timber by the use of preservatives is urged. The statement that in the United States to-day there are 90 millions of uncreosoted railway sleepers in use is startling to Europeans.

Chapter XVI deals with "Forest Enemies"; the Americans have their full share of these, though they are spared the most destructive of all, the rabbit and the pine weevil (*Hyllobius abietis*).

There is little for a reviewer to criticize in this useful and informative volume; it would be well that it were placed in the hands of schoolmasters in all woodland districts.

One slip the authors make when they say Sequoia grows only on the coast of Northern California, they forget *Sequoia gigantea* of the Sierra Nevada. Ginkgo is spelled in two ways in the excellent fourth chapter which epitomizes admirably the changes in the types and distribution of arborescent species: "When conditions change too rapidly for a plant or animal species to keep pace it dies. We say that it has become extinct." We shall never know, however, why certain species, e.g. *Pinus insignis* and *Cupressus macrocarpa*, not all exigent in their requirements, should have disappeared from the world except in a tiny area of California. We would prefer that such nomenclature as "pitch pine" and "red cedar" had been accompanied by specific names. The latter name is commonly applied to species of at least four distinct genera in North America. The frequent clipping of the infinitive slightly annoys English ears, and the adjective "colorful" is not one we are addicted to. These seem to be carping criticisms of a lively book so deserving of commendation for its wise advice and sustained interest.

"The Lawn." By L. S. Dickinson. 8vo. 128 pp. (Orange Judd Co., New York, 1930.) \$1.25.

The vast area of the United States introduces difficulties which we know little of in preparing a book for popular consumption on lawns, and the author does well to point out the fact that grasses suitable for one latitude are quite unsuited

for another. In America, too, all the turf grasses are exotics; here they are native.

A book produced with such limitations cannot be more than suggestive in this country and a reader will find it certainly is that. Most phases of lawn making and maintenance are dealt with, and the only criticism we have to make is that there are more than there need be of orthographical errors and too many split infinitives to please a sensitive ear.

"Recent Advances in Plant Physiology." By E. Barton-Wright, M.Sc. 8vo. x + 351 pp. (Churchill & Co., London, 1930). 12s. 6d.

In his presidential address to the Botanists at the Oxford (1926) meeting of the British Association, Professor F. O. Bower reviewed the more recent development of the science of Botany. He stated that: "As we pass from 1894 to the current period we perceive a marked shifting of the interest of botanists from the study of form to that of the intimate constitution and functional activity of plants. Whole fields of colloidal chemistry and physics, of quantitative physiology of cytology and genetics, of ecology, of fungology and bacteriology, have been opened up. The present century has been specially marked by the extension of opportunities for physiological research, by better equipment of departments in the universities, and by the foundation of independent establishments carrying on experimental inquiry in its broadest application. This is rapidly bringing the science into closer relation with Imperial and social aims. . . . Experimental results have gradually taken the preponderant place over description and comparison. . . . For better, for worse, the pendulum has definitely swung over from the extreme systematic position of half a century ago, through a phase of prevalent morphology (or perhaps we should better say of organography) to an extreme physiological position at the present time."

His remarks conclude with the confident anticipation of "a return towards some middle position" in which the comparative study of form may not be detached from, or unduly neglected on account of, the study of function.

The foreword of the present volume, written by Professor Ruggles Gates, gives expression to similar thought: "It is a fortunate circumstance that, although animal physiology is studied and taught as a science quite independent of zoology, plant physiology has always remained an integral part of botany. The correlated investigation of form and function is an ideal which is often expressed as one of the chief aims of biology, but owing to the divorce of physiology from zoology each of these sciences has gone its own way. . . . As regards plants, it has been a source of strength to botany that no such formal separation of its two main branches has ever taken place. Although plant physiology has thus remained in intimate touch with the rest of botany, yet it has become in some respects an independent science, in relatively close relationship with chemistry, biochemistry and physics. Indeed, as will be seen from the contents of this book, the subject is ever reaching further in the application of data and methods from physics, chemistry and mathematics."

Broadly speaking, the horticulturists of the last fifty years have paid considerably more attention to the study of form than to that of function, and have left this study in the hands of a few experimentalists. During the period under review one has witnessed the growth and expansion of the chain of research institutions, many of which deal with economic plants; much of the work of these institutes falls in the category of plant physiology, so that during the next ten years there is every likelihood of an increase in the rate of advance of this science taking place, and of a more close co-operation between science and the industries of Agriculture and Horticulture.

The present volume forms a review of the advances made during the last ten years in the study of function; such a review must, of course, be of a technical nature, and this book therefore will be appreciated by advanced students and teachers primarily, though it is hoped that the general reader interested in Horticulture will find certain sections of the text particularly interesting.

The modern hypothesis of the nature of the soil reactions—the interchange of bases, and the colloidal structure—is clearly presented. The author, fortunately, shows us the relationship of such chemical considerations to the practical operations of plant cultivation. The connecting link, which is now being strengthened by further research, is forged from the material collected in investigations upon root absorption and root development. Many gardeners may have often wondered at the capability of the plant to absorb and store considerable quantities of substances frequently found only in dilute solutions

and in relatively small quantities in the soil—these and cognate problems of the soil form the subject of the earlier chapters.

In any actively developing science, present theories advanced to explain observations are liable to be disproved and discarded and amended in the near future. For this and other reasons, scientific investigators are wisely cautious and may delay publication of important results until as complete a verification as can ever be hoped for is attained; thus the author of such a book cannot always present accurately the "up-to-date" position of any special branch of his subject. In this connexion, there would appear to be little doubt that further progress has been made in the study of plant respiration and assimilation than is recorded in those pages which deal only with published work.

To horticulturists particularly, the chapters dealing with problems of the dormancy and germination of seeds and the growth and nutrition of flowering plants will make direct appeal. Yet the fundamental importance of the recent achievements of biochemists cannot be overlooked by the serious student of Biology. In this text we read of such achievements; for example, the brilliant work of Sir Gowland Hopkins and his associates has enabled us to picture more clearly the mechanism of the oxidation processes of the protoplasm of both animal and plant tissues, in terms of the reacting substances and the energy released for other metabolic processes. Recent investigations concerning the catalytic agents (or enzymes) facilitating these changes are also described.

Throughout the text the author does not hesitate to criticize in a severe and trenchant manner theories propounded without substantial evidence.

Generally the meaning of the text is clear. A wide range of literature is brought under review: the author's selection of what he considers to be important papers is one upon which there is likely to be a general measure of agreement. Graphs and formulae are frequently used in illustration, interspersed with a few illustrations. A few minor errors have been detected in the legends of the graphs and in the references to the literature. This is unfortunate.

This book is recommended to senior students and to teachers, as we consider it will prove a useful introduction to, and survey of, the investigations proceeding at the present time in this important branch of Botany.

"*Chrysanthemums for Amateurs.*" By A. J. Macself. 8vo. 174 pp. (W. H. & L. Collingridge, London, 1929.) 5s. net.

This is the latest addition to the many books dealing exclusively with the *Chrysanthemum*. The contents are divided into seventeen chapters in which cultural routine, types and forms of the flower, stopping and timing, raising from seed, etc., and the *Chrysanthemum's* enemies and friends, each receive consideration. We are not very favourably impressed with the manner in which the subject is treated; in our opinion it leaves much to be desired. There is a want of conciseness, except perhaps in Chapter IX: in this chapter, dealing with the cultivation of specimen plants and late flowers, the advice is practical, instructive, and to the point. Early-flowering *Chrysanthemums* are considered at some length and the advice is generally useful. Greater care, however, should have been taken in the names of the varieties selected: for instance, 'Hollicot' (not Hollicat) Yellow' is the proper name for 'Goldfinder'; 'Candida' (the beautiful white) is the correct name, not 'Sanctity': both varieties raised by an English gardener. We were interested in what is written with reference to the large exhibition varieties, but more care should also have been taken to see that the names were properly spelt. 'Charles Davies' should be 'Charles Davis'; 'Mrs. B. Carpenter,' not 'Mrs. Boyd Carpenter'; 'Franconia,' not 'Foranconia'; 'Pockett,' not 'Pocket.' There are other instances where the names are not correct. Single-flowered varieties are also dealt with, but the writer's ideas are somewhat at variance with those generally accepted; he should have consulted the Classification of Singles as prepared by the National *Chrysanthemum* Society. There are many illustrations, and the photographic reproductions generally are good, but those in the text, in some instances, are very poor.

"*Wild Gardening.*" By E. H. M. Cox. 8vo. 124 pp. (Dulau, London, 1929.) 5s. net.

This book would have been better called "The Making of My Wild Garden," for that is what it describes, and the reader may learn a great deal incidentally from the story, though the details may not fit his circumstances. Judged as such the book was well worth while: but perhaps not quite so much worth while as a treatise on "Wild Gardening." One's mind goes back inevitably to William Robinson's "Wild Garden" when one sees a book on the subject, and that book has possibly not yet been equalled. We have an infinitely greater number of

things to choose from than in the day of the publication of that book, but the principles of wild gardening remain as then, and they were stated by him with all the insistence of which he was capable and all the clarity which marked his writing.

Only when one comes to do it are the difficulties of applying the principles to the making of a wild garden apparent. Wild gardening, so as to secure general approval, is a very high art. Probably in it gardening reaches the highest development of its art. There is seen that order, that controlled wildness, which produces what appears to be an unstudied harmony, never looking as though it were "gardenized," yet never looking unkempt. It gives the greatest scope for individuality, for no two places are alike, and in no two can the same results be obtained—indeed, it is foolish to try to obtain the exact results one has seen in another place.

So we find the advice given in this book and the selections of plants suggested are both coloured by the limitations of the author's circumstances, and different sites, different aims, different minds, will all need to modify the means in other circumstances. Only one thing is clear: a wild garden must be a matter of personal contrivance. A harmonious whole, as it should be, cannot result from the interference of many minds; nor can it be contrived if those who work in it have not learned a spirit of toleration, and to know when to leave well alone.

"Herbs, Salads and Seasonings." By X. M. Boulestin and Jason Hill. (Heinemann, London, 1930.) 6s.

The "wort cunning" of our native cooks has for a century been mainly limited to Thyme, Sage, Parsley, and Mint. In France a much wider range is available and the "bouquet" which is prescribed for most meat dishes often contains a dozen or more herbs. For our instruction and delight Mr. Boulestin has produced this little book in which his well-known mastery in all culinary matters is once more shown forth. The necessary garden knowledge is provided by Mr. Hill, and some rather characterless drawings are added from the pen of Mr. Cedric Morris.

Mr. Boulestin rightly condemns those musty packets of dried herbs, and shows us how to grow and use a wide range of plants for seasoning and salads; and a perusal of this well-printed book should stimulate many of its readers to make their kitchen garden more useful and interesting.

How few gardens grow Chives, the most delicate of the Onion family, or use the lemon-scented Verbena in place of the fast-vanishing Balm.

Very valuable are the hints on salads, and the town dweller will note with gratitude the method of reviving a withered Lettuce. The author does not mention Lemon Juice as a substitute for Vinegar, but English Vinegar being what it is, it is wise to use Lemons in hotels and places where they eat. Wine Vinegar can easily be procured in this country, but few people seem to have realized the fact.

We conclude by thanking Mr. Boulestin for the admirable missionary work he is doing in this country. He is fighting desperate odds: the national inertia in culinary matters, the massed attack of the "ready for use" packeteer; but we beg him not to desist. Already we see, not perhaps over the Welsh mountains, but in many households nearer home, faint signs of the coming dawn.

"Cut Flowers for Market." By F. J. Fletcher, F.R.H.S. (Benn, London, 1929.)

This book, written avowedly for the grower with a limited experience, contains much that cannot fail to be helpful to the uninitiated. This applies particularly to the section of the book dealing with the cultivation and marketing of annuals and biennials. A grower of those that are mentioned, following the instructions and advice given, should be able to cultivate and market his produce successfully.

When one passes to the sections dealing with Herbaceous Plants, Bulbs, etc., the author leaves himself open to considerable criticism, not so much perhaps on the cultural side (although there is much recommended so far as cultivation is concerned that I would be very loath to follow) as for the out-of-date and in many cases impossible varieties that are named as the best for market and forcing. To instance a few: *Phlox decussata*, not more than four of the varieties mentioned are worth growing for market; of the *Pæonies* named not one is worth growing for cut flowers. Who would grow Rose 'Henrietta' or Malmaison Carnations for cut flowers? 'Beauty of Holland' is an unknown *Gladiolus*, and 'Brenchleyensis' is entirely superseded. In Spanish Iris, 'Cajanus,' the best yellow, and the two best whites, 'l'Innocence' and 'Queen Wilhelmina,' are not mentioned. The best section of Iris for forcing or outdoor culture, Dutch Iris, is entirely omitted, although it is grown by the million. The variety 'l'Unique,' named in the English section, is a Spanish Iris, not English. What is Iris 'Imperial'?

Does the author mean 'Imperator,' which is not a novelty? Of the *Narcissus* named (p. 64), 'Cynosure,' 'Butter and Eggs,' and 'Eggs and Bacon' are absolutely back numbers for market cut flowers. The order of blooming as "roughly placed" is certainly rough. 'Soleil d'Or,' 'Golden Spur,' 'Grand Primo,' 'Van Zion,' 'Princeps,' 'Sir Watkin,' and the remainder together, would be much nearer the mark.

The selection and order of the early-flowering Tulips would give one the idea that the author had been taking advice from some inexperienced amateur. 'Chrysolora,' 'Cottage Maid,' and 'Enchantress' are not forcing Tulips, but 'Duke of Austria,' presumably intended for 'Prince of Austria,' which is mentioned as a non-forcer, is undoubtedly one of the best six single varieties for forcing. Of the Darwins mentioned for forcing two are not forcers, viz. 'Baronne de la Tonnaye' and 'City of Haarlem.' 'Bartigon,' 'Wm. Pitt,' and 'Pride of Haarlem,' three of the best forcers, are not given.

Pyrethrums (p. 43) are rarely if ever raised from cuttings; division is the correct method. Many perpetual Carnations (p. 51) are strongly perfumed, and more are cut in summer than at any other period, notwithstanding the author's assertion to the contrary. English Iris (p. 62) are not "improved Spanish Iris."

One gets the impression that the author is much more "at home" with outdoor cultures than with the forcing house. Bulbs (p. 64), when boxed or potted, should never be covered with ashes, as the sulphur from the ashes is very harmful.

The book wants thoroughly revising, as it abounds in mis-spelt names.

"Orchids for Amateurs." By T. W. Briscoe. 8vo. 136 pp. (W. H. & L. Collingridge, Ltd., London, 1930.) 5s. net.

As its title denotes, this book has been written for the amateur, and on that account a large part of it has rightly been devoted to cultural details. Composts and methods of potting are fully explained, while other chapters deal with the treatment of imported orchids, insect pests and diseases, and propagation. The second part of the book is occupied with chapters on the various genera, species, and varieties that are generally considered suitable subjects for amateurs to include in their collections. Many illustrations, photographic and otherwise, add greatly to the interest of the pages. Although the title "Orchids for Amateurs" is not original, for it was used by Britten and Gower half a century ago, it well explains the nature of this useful addition to Orchid literature.

"Plant Biology." By H. Godwin. 8vo. 265 pp. (Cambridge University Press, 1930.) 8s. 6d.

This textbook is designed to assist first-year students of biology and of medicine particularly. Its distinguishing feature is that the author deals with the living organism and its functions. Far too many of the innumerable elementary textbooks are primarily concerned with and often overburdened with morphological details; in fact, it is not surprising that many intelligent students reading widely in biology fail to be attracted to our subject, the textbooks of which often emphasize unduly some such trivial detail as the shape and difference between a crenate and serrate leaf margin. Dr. Godwin's book, with its physiological and biochemical outlook, reflects the modern tendency of botanical thought, and particularly of the school to which he is attached, for physiology and biochemistry are now providing us with the details of the process of plants concerning which much had previously been merely surmised.

A study of the chapters of this little book in which the metabolism of the flowering plant is described would repay all elementary students who seek to learn how a plant feeds and lives. Unfortunately many horticultural students are not sufficiently well equipped with chemical knowledge to derive the maximum benefit possible from such a study (unless chemistry is studied also), but nevertheless we recommend to them particularly the chapters dealing with photosynthesis, bacteria, and fungi, as well as that concerned with general metabolism.

As medical students, and other biologists too, would undoubtedly appreciate a simple comparative account of the growth, and rate of growth, of typical organisms—bacteria, plant and animal—it is regretted that the elementary nature, and perhaps more especially the size of the present volume, have restricted the author's account of growth to a few paragraphs on pp. 54 and 55, and other general references in the text.

Dr. Godwin's ability as an artist (he employs the bold "black and white method" of expression) has enabled him to provide many new and clear diagrams in illustration of the text. Tables are also used to convey much information in

little space. The author expresses in his preface the opinion that his book is suitable for expansion by teacher or lecturer; the tables certainly are.

Throughout, the text is surprisingly free from inaccuracies and misprints, but one would appear to have escaped detection on p. 20, where " 6×10^{-8} sq. cms. = 600 sq. metres" appears as the area of the surface of a cube of sides 1 cm. cut into cubes of ultra-microscopic size.

The small and convenient size of the book ensures that it can be easily slipped into the pocket of the student hastening from lecture to lecture in the short eight-weeks term.

We thoroughly recommend this book to all students; a complete mastery of its contents will enrich their botanical outlook by giving them the more modern "biochemical view-point" of the living organism.

"Die Aphelenchen der Kulturpflanzen." By Dr. H. Goffart. iv + 105 pp.; 42 figs.; 1 col. plate. (Julius Springer, Berlin, 1930.) 14.80 RM.

The order *Nematoda*, members of which are usually referred to as eelworms, contains a great number of free-living and parasitic forms. Among the latter are found numerous plant parasites, including species of the genus *Aphelenchus*. We are indebted to the author for bringing together the available data of a group which is of vast economic importance to the cultivator of plants. We likewise commend the publishers on having produced an attractive bulletin, not only as regards the type but in the reproduction of the numerous figures, both original and borrowed.

The symptoms of attack are clearly stated and, together with the illustrations, will be found extremely useful in the diagnosis of the several diseases.

The book is divided into two parts, viz.: (1) General, and (2) Special, whilst each part is subdivided into sections. Part 1 deals with Systematics of the Group, Morphology, Bionomics, Variability and Migration. One section is devoted to a discussion of Control Measures, whilst the final section deals with Technique.

Part 2 comprises a detailed review of the species under section headings of (i) True Plant Parasites, 6 spp.; (ii) Partly Parasitic Species, 9 spp.; and (iii) Uncertain Species, 2 spp.

The penultimate section includes an alphabetical index of the Aphelenchi with synonyms and a summary as to the relative and absolute structures of the species. The final section is bibliographical (7 pages).

In Table 1 we find enumerated the six more common species with their principal host plants, together with the habitats of both host plants and parasites.

The formidable list of 111 host plants (pp. 64-66) will indicate to the grower the importance of this genus and the necessity of early recognition whereby an infection may be stayed.

Eelworms are among the most difficult animals to control in the field, and a perusal of the remedial measures advocated by the author only tends to confirm this statement.

We have no hesitation in commending this monograph to all intelligent growers who take an interest in the health of their plants, whilst the student of plant pathology should not hesitate to add this volume to his reference library.

"Bacterial Metabolism." By Marjory Stephenson, M.A. 8vo. ix + 320 pp. (Longmans, Green & Co., London, 1930.) 18s.

This is one of the series of monographs on Biochemistry edited by Dr. Plimmer and Sir F. Gowland Hopkins, F.R.S. The editors have kept two objects in view: that each author should be working at the subject with which he or she deals, and that a Bibliography, as complete as possible, should be included. The aim is that each monograph shall give full and definite information of the work which has been done upon the subject. The author states that "The aim of this book has been to choose from the mass of data on the chemical activities of bacteria, facts which may help us to gain an insight into the essential chemical processes accompanying the life of the organisms concerned; to form any coherent picture of these happenings is at present beyond our powers. An attempt is made to arrange the scattered data in order to appraise our knowledge of bacteria as *living organisms* apart from their rôle as disease germs or the bearers of commercially important catalysts."

The metabolism of the microbes presents many entertaining and novel features. The author considers the machinery by which bacteria induce, or otherwise influence, various chemical reactions, associated with such changes

as putrefaction, fermentation, oxidation and nitrification, in relation to the energy released in these chemical processes. The great chemical activity of bacteria as compared with that of the higher animals (and plants) is concomitant with their rapid rate of growth when the environmental conditions are suitable. Such a combination of circumstances does not often occur; moreover, the death-rate is frequently exceedingly high. It seems that a great deal of the energy liberated by bacterial activity is not directly utilized by the metabolic processes but is an outcome of the action of unprotected enzymes upon various substrata.

The text contains a consideration of the principles involved in the study of the nutrition of bacteria. The organisms live upon materials which, regarded from the view-point of the higher animal, appear decidedly unpromising. Much information is given concerning the cultivation of pure colonies of bacteria on various synthetic media, and methods that have enabled investigators to study the requirements and reactions of the organisms.

It is almost unnecessary to point out that Chapter VIII, dealing with the fixation of nitrogen, is of much direct interest to all tillers of the soil; it is a clear account of the valuable work, finally accomplished by Winogradsky, upon the different nitrifying bacteria which oxidize ammonium salts ultimately to nitrates. These organisms develop in media from which all organic material has been excluded.

Lastly, special mention must be made of the valuable Appendix, in which are given the formulae for the preparation of the culture media upon which to grow different bacteria, and of the valuable Bibliography, comprising some seven hundred titles, including papers recently published.

"Our Catkin-Bearing Plants." By H. Gilbert Carter. x + 61 pp. (Clarendon Press, 1930.) 4s. 6d.

This is a delightful little book written by the Director of the Cambridge Botanic Garden, whose original and refreshing outlook cannot fail to be appreciated by all teachers who may introduce students to the British Flora.

The subject dealt with is the British trees and other catkin-bearing plants, including nettles, figs, mulberry, and hops. The botanical descriptions are accurate and—besides being couched in simple terms—clear, and the photographs excellent. It is a useful companion volume to the standard floras.

Throughout the text the author explains by footnotes the classical derivation of all generic and trivial names and introduces his readers (as he does his students) to "early literature," to the *Georgics* and the *Aeneid* of 25 B.C.

It is to be regretted that the modern cost of production will prevent many from buying a charming little book just for the pleasure it is bound to give those who read, or only glance at, its pages.

NOTES AND ABSTRACTS.

[For Index of Periodicals quoted see previous volumes.]

Abelia triflora. By O. Stapf (*Bot. Mag.*, t. 9131; Jan. 1928).—A shrubby species from the Western Himalaya, where it grows at an elevation of 5000 to 9,000 feet. Flowers sweet-scented, almost white (pink in bud) in clusters. Hardy. Propagated by cuttings.—F. J. C.

Abies Faberi Craib, et *A. Forrestii* Craib. By O. Stapf (*Bot. Mag.*, t. 9201; May 1930).—These two Chinese species are distinguished and figured. Both had been included under *Abies Delavayi*, and the former was originally described as *Keteleeria Faberi* and *Pinus Faberi*.—F. J. C.

Actinidia coriacea Dunn. By O. Stapf (*Bot. Mag.*, t. 9140; March 1928).—Native of Szechuan, introduced by E. H. Wilson in 1904. Hardy in Sussex, where it produces its bright red flowers in June. A climber with lanceolate leaves about 3 inches long.—F. J. C.

Aphelenchus, *Tylenchus* and *Heterodera*, On Some Details of Comparative Anatomy in. By T. Goodey (*Jour. Helminthology*, vol. vii. No. 4, Dec. 1929, pp. 223-230; 4 figs.).—The importance of anatomical detail in determining the species of parasitic and saprophytic eelworms is explained. Detailed examinations have been made of species belonging to the important genera *Aphelenchus*, *Tylenchus* and *Heterodera*.

Descriptions are given of the openings of the oesophageal glands, the shape of the stylet, the comparisons between the general body forms in both sexes and the cephalic glands (amphids) in *Aphelenchus parietinus*.—G. F. W.

Aphis as a Possible Vector of "Breaking" in Tulip Species. By A. W. McKenny Hughes (*Ann. App. Biol.*, vol. xvii. No. 1, Feb. 1930, pp. 36-42; 1 plate).—Previous work on the phenomenon known as "breaking" in tulips indicated that the aphid was the probable carrier of a tulip "breaking virus." Investigations were commenced in 1928 to discover the natural vectors of this phenomenon.

Four species of aphides known to occur on tulips were used in the experiments, detailed descriptions of which are given. The habits and food plants of the following species of aphides are given: *Anuraphis tulipae* B. de Forc., *Rhopalosiphoninus tulipaella* Theib., *Macrosiphum gei* Koch, and *Myzus persicae* Sulz.

It is clearly stated that the results obtained must necessarily be accepted with caution, and that further data are necessary before final conclusions can be drawn.

Myzus persicae is suggested as a carrier of the virus known as "breaking" in tulips, and also that "red-streak break" is also associated with this species. *Macrosiphon gei* is a possible vector of break in a lesser degree, and is also associated with "white streak." Negative results have so far been obtained with the other two species of aphides.—G. F. W.

Apple Blossom Weevil, the Control of the. By A. M. Massee and M. Beshir (*Jour. Min. Agric.*, vol. xxxvii. No. 2, May 1930, pp. 164-171).—The most satisfactory control of *Anthonomus pomorum* is attained by the use of sacking band traps which are placed round the tree trunk (vide *R.H.S. Jour.*, 50, Pt. I, pp. 135-136). On large farms it is difficult to obtain sufficient old sacking for this purpose and the time occupied in cutting the sacking into strips is considerable. It was found that a speedier and cheaper method is to use corrugated cardboard bands 4½ inches wide covered on the smooth surface by greaseproof paper of single thickness only.

A new method of destroying weevils trapped in the sack bands is described. A saving in cost and labour by removing the bands and either burning them or submerging them in a tub of boiling water is attained by thoroughly spraying the bands and the bark beneath them with a 10 per cent. tar-distillate wash in December or January. Later application will minimize the good effect as the weevils commence to leave the bands during February.—G. F. W.

Apple Fire Blight. By P. W. Briller (*Jour. Agr. Res.*, 39, pp. 579-621; Oct. 1929).—Numerous experiments and observations on the fire blight disease of apples which is prevalent in Wisconsin and is due to attacks by *Bacillus amylovorus* are reported, but beyond indicating that insects and storms of rain are the commonest means by which the bacillus is spread, and that cutting out affected shoots is the readiest means of checking it, no conclusions are drawn.

F. J. C.

Apples, Quality and Maturity, Studies of. By J. L. St. John and O. M. Morris (*Jour. Agr. Res.*, 39; Oct. 1929).—The authors can find no formula which will accurately state the quality of apples in chemical terms. Taste they regard as the most dependable basis. The best quality of apples is developed when the fruit and adjacent foliage are well exposed to sunshine and dry air. Shading tends to retard the development of quality. The method of pruning exercises great influence over quality and uniformity of the crop, and fruits attaining maturity on the tree are of better quality than those picked prematurely.—F. J. C.

Bud Borer, The Control of the Red. By L. N. Staniland and E. Umpleby (*Jour. Min. Agric.*, vol. xxxvii. No. 1, April 1930, pp. 59-63).—The heavy infestation of freshly budded apples and roses by the larvae of the Red Bud Borer, *Thomasiniana oculiperda* Rüb., at Long Ashton during the season 1925-26 called for a serious attempt to be made in controlling this pest.

Experiments were carried out over three seasons, 1926-28, and the results obtained are set out in a series of tables.

The most satisfactory preventive against attack was obtained when vaseline was coated thoroughly over the buds immediately after tying. The percentage of "takes" of buds on treated plants was not adversely affected and, though it has not been proved that this percentage is increased, it is suggested that callus formation is greatly stimulated.—G. F. W.

Calystegia tuguriorum Hook. f. By O. Stapf (*Bot. Mag.*, t. 9136; Jan. 1928).—A white-flowered *Convolvulus* from New Zealand, Juan Fernandez, and Chile. Hardy, but not ramping, in favoured places in this country.—F. J. C.

Celsia bugulifolia. By O. Stapf (*Bot. Mag.*, t. 9130; Jan. 1928).—Discovered in 1701, introduced to cultivation by M. Leichtlin about 1875, lost and reintroduced in 1922. S.E. Europe. Hardy and perennial, with a spike of curiously coloured flowers, yellowish with red streaks in the upper part, livid grey in lower.—F. J. C.

Colchicum elileum. By O. Stapf (*Bot. Mag.*, t. 9135; Jan. 1928).—A plant from the Cilician Taurus often confused with *C. byzantinum* from which it differs in its larger flowers and in some minor points. Like its relatives, an autumn-flowering hardy bulb easy to accommodate.—F. J. C.

Columnnea microphylla Bilotzsch. et Hanst. By O. Stapf (*Bot. Mag.*, t. 9203; May 1930).—Related to *C. Verstediana*, but with smaller flowers pilose above, and recurved calyx segments. Native of Costa Rica, where it grows as an epiphyte, this needs a warm house.—F. J. C.

Cornus paucinervis Hance. By O. Stapf (*Bot. Mag.*, t. 9197; May 1930).—A shrub up to 10 feet high, usually growing on stream sides from Yunnan to Szechwan and Hupeh. Foliage dull green, flowers white (creamy because of yellow anthers) in many-flowered flat corymbs about 3 inches across, in July and August. Hardy. *C. quinquenervis* is given as a synonym.—F. J. C.

Currant Rust (Sur l'hibernation du Puccinia Ribis à l'état végétatif dans les bourgeons d'hiver de la plante hospitière). By J. Eriksson (*Comptes rendus*, 190, p. 815; March 1930).—The author considers that the rust fungus of the currant hibernates as mycoplasma in the winter buds of its host.—F. J. C.

Ephedra procera Fisch. et Mey. By O. Stapf (*Bot. Mag.*, t. 9204; May 1930).—A somewhat involved synonymy is given for this native of Greece eastwards to Afghanistan. It is a tall species, 3 or 4 feet high, with smooth, green twigs and bright red fruits.—F. J. C.

Erica Pageana. By L. Bolus (*Bot. Mag.*, t. 9133; Jan. 1928).—A Cape heath nearly related to *E. campanulata* but more robust, and having the corolla-tube narrowed below the middle, longer filaments and toothed anthers. The orange-yellow flowers are about a quarter of an inch long, open at the mouth, with included anthers.—F. J. C.

Erythraea scilloides Chaub. By O. Stapf (*Bot. Mag.*, t. 9137; Jan. 1928).—Recognized as a native plant in 1918, this has a synonym as extensive as its range on the western shores of Europe. A glabrous perennial with a rosette of crowded leaves, producing numerous cymes of bright pink (rarely white) flowers. F. J. C.

Fire Blight, History of Pathogen. By H. R. Rosen (*U.S.A. Exp. Sm., Arkansas, Bull.* 244; Oct. 1929).—Pears were the first fruits to be severely attacked by fire blight, but certain varieties of apples are also very susceptible, and the author's investigations show that to some extent the Burbank plum, rose, *Spiraea Van Houttei*, *Cydonia japonica*, species of *Amelanchier* and species of *Crataegus* may also be attacked. Flowers are the chief place of entry, and if these are absent or are killed by frost the disease rarely spreads. The investigations carried out indicate that infected shoots are the chief source from which the disease spreads in early spring, and that the disease organism overwinters on both apples and pears.—F. J. C.

Fruit Bud Formation, Studies in. By E. Johansson (*Medd. fr. Perm. Komm. f. Fruktodlingsförsök*, 19; 1930; figs.).—The differentiation of the fruit buds was studied in Sweden in Apples, Pears, Plums, and Cherries. In the Yellow Transparent Apple the rudiments of the flower were formed by July 23, in Cellini, Melon, and King of the Pippins somewhat later. In Pears, July 27 for the earliest, somewhat later for Louise Bonne; in Plums, Victoria was first (by August 23), later varieties were later in producing blossom primordia; in Sweet Cherries they were visible in early July.

Fully formed buds were found in all varieties before the onset of winter, but not all the flower buds had reached the fully developed stage by that time.

F. J. C.

Fruit, Parthenocarpy and Self-pollination in. By V. A. Kolesnicov (*Bull. Salgir Pom. Exp. Sta., Russia*, 2, 1927).—Most varieties of apples were found self-sterile, and there was little tendency to parthenocarpy. More fruit was formed when flowers were artificially self-pollinated than when the flowers were selfed in bags. Pears showed a greater tendency to self-fruitfulness and parthenocarpy than apples. Little difference, except at times in shape, and in time of ripening, which is delayed, was found between selfed or parthenocarpic fruit and normally produced fruit of the same variety. Flemish Beauty (often without carpels), Beurré Ligel, Williams' Bon Chrétien, Curé, and Beurré Diel were found to have a great tendency to self-fruitfulness and parthenocarpy, while there was little in Doyenné d'Hiver, Beurré Bosc and Beurré d'Ardenpoint.

Most peaches were found self-fruitful, but few plums, and very few cherries, none of the sweet cherries being found self-fruitful.—F. J. C.

Fruits of Apple, Materials about the Biology of. By V. A. Kolesnicov (*Bull. Salgir Pom. Exp. Sta.*, 2, 1927).—The author found correlation between height and diameter of fruit and of core in apple, but little between weight of fruit and weight of stone in cherries. There was found some relation between the weight of apples and the length of their stalks, the heavier having the shorter stalks.—F. J. C.

Fruits of Cherries and Sweet Cherries, About Biology of. By V. A. Kolesnicov (*Bull. Salgir Pom. Exp. Sta.*, 2, 1927).—This paper is concerned with comparison between weight of seed and of fruit in apples and cherries.—F. J. C.

Garlic, Wild, and its Control. By M. W. Talbot (*U.S.A. Dep. Agr., Leaf.* 43; July 1929).—*Allium vineale* can be destroyed by deep digging about November; repeating in each of three years was found to be the best means of eradicating; wild garlic. Spraying methods were followed with but partial success. Two teaspoonfuls of crude carbolic acid applied to isolated plants killed them.—F. J. C.

Halimium umbellatum Spach. By O. Stapf (*Bot. Mag.*, t. 9141; March 1928).—A white-flowered shrub about 10 inches high with linear leaves. Native in open woods in the Iberian Peninsula, North Africa, Greece and Rhodes. Flowers in 3-5-flowered umbel. Apt to be killed in severe winters.—F. J. C.

Mustard as a Factor Inhibiting Cyst-formation in Heterodera Schachtlii, Preliminary Researches on. By Marjorie J. Triffitt (*Jour. Helminthology*, vol. vii. No. 2, June 1929, pp. 81-92; 1 fig.).—Preliminary experiments commenced in 1924 indicated that mustard seedlings grown and broken up into soil heavily infected with the sugar-beet nematode had the effect of limiting the infestation on a potato plant grown immediately in that soil. Subsequent experiments showed that the substitution of other organic matter in the soil did not have the same effect. It

is supposed that some chemical constituent of the mustard plant is released by the decomposing tissues and checks the eelworm at some period of its life history.

It has been proved that this substance is present throughout the plant and, further, that the growing roots exercise a stronger influence in diminishing the infectivity of the eelworm to the potato plant than do the roots when broken up and mixed with the soil. The conclusion is that the substance inhibitory to the eelworm is given off by the growing roots, although it is present throughout the plant.—G. F. W.

Pæony Root Galls, Further Notes on the Treatment of. By N. A. Brown (*Amer. Peony Soc. Bull.*, 24, March 1930, pp. 34-35).—Success in destroying the root-knot eelworm in Pæony roots is reported. The roots are immersed in water at 120° F. for thirty minutes. This temperature must not be exceeded.—F. J. C.

Pear Leaf Blister Mite as an Apple Pest, The. By I. M. Hawley (*U.S.A. Exp. Sta., Utah, Bull.* 197, June 1926, pp. 3-13; 2 figs.).—*Eriophyes pyri* was introduced into the United States and Canada from Europe some time before 1872, and confined its activities to the pear until about 1902. Since that year it became a serious pest of apples in many of the fruit-growing areas in Western America.

The symptoms by which an attack can be recognized on both hosts are described.

Short descriptions of the egg, larval and adult stages are given, together with an account of the life history.

At least 250 varieties of apple are recorded as hosts, but there is a decided varietal difference in the way it affects the foliage of the several varieties.

It was found that the mite can be successfully controlled by a spring application of lime-sulphur (1-12) applied not later than the green-tip stage.—F. J. C.

Pears, Core Breakdown, Relation of Picking Time to Acetaldehyde Content of Bartlett. By C. P. Harley (*Jour. Agr. Res.*, 39, pp. 483-493; Oct. 1929).—Pears picked in advanced stage of maturity broke down more rapidly than fruit picked earlier. Acetaldehyde was not present when fruit was picked from the tree, but developed quickly in the ripening room, and more rapidly in late than in early picked fruit. Studies were made of the oxygen and carbon dioxide contents of pears at different stages, and the conclusion is arrived at that the connexion of carbon dioxide content with breakdown is in the establishment of optimum conditions for the production of acetaldehyde.—F. J. C.

Phalaenopsis violacea. By V. S. Summerhayes (*Bot. Mag.*, t. 9138; May 1930).—Native on trees in Sumatra and Perak. A species with relatively small but brightly coloured flowers.—F. J. C.

Photinia prionophylla. By O. Stapf (*Bot. Mag.*, t. 9134; Jan. 1928).—At one time called *Eriobotrya prionophylla*, this evergreen shrub from Yunnan bears corymbs of small white flowers and deep red fruits. The leaves are deeply and sharply toothed. Whether hardy over most of England is unknown, but it has flowered in the open in Cornwall.—F. J. C.

Pleurothallis (?) ophioccephala. By O. Stapf (*Bot. Mag.*, t. 9128, Jan. 1928).—From Guatemala and perhaps Mexico. A cool-house orchid with single flowers about an inch long, narrow, yellow with copious brownish-red spotting.—F. J. C.

Polysulphide Sulphur in Relation to the Fungicidal Efficiency of Certain Spray Materials. By W. Goodwin, H. Martin, and E. S. Salmor (*Ann. App. Biol.*, vol. xvii. No. 1, Feb. 1930, pp. 127-136).—This paper is a classified and summarized account of the results of fifteen years' investigation of the fungicidal properties of solutions containing sulphur in polysulphide form upon the powdery mildew of the hop, *Sphaerotheca Humuli*. The fungicidal efficiency of various lime sulphurs, liver of sulphur and solutions containing sodium, potassium, ammonium, calcium and barium polysulphides have been compared. It has been shown that, in every case, the effect upon the fungus, when growing under identical conditions and provided that the sprays are applied under standardized conditions, is determined entirely by the polysulphide sulphur content of the spray fluid. Hence, the estimation of the amount of polysulphide sulphur present provides a measure of the efficiency of these materials against *S. Humuli*.—G. F. W.

Poppy, Bacterial Blight caused by Bacterium papavericola, sp. nov. By M. K. Bryan and F. P. McWorter (*Jour. Agr. Res.*, 40, pp. 1-10; Jan. 1930; figs.).—This bacterium produces zoned black spots on foliage of Shirley and Oriental poppies, and may spread sufficiently to kill the plants. No control measures are suggested.—F. J. C.

Primula Cawdoriana F. K. Ward. By O. Stapf (*Bot. Mag.*, t. 9196; May 1930).—Discovered by Ward in Tsangpo in 1924 and raised from seed in several places, but we fear lost. Flowers trumpet-shaped with a wide starry mouth, mauve.—F. J. C.

Primula pinnatifida Franch. By O. Stapf (*Bot. Mag.*, t. 9138; Jan. 1928).—Belonging to the Muscarioides group of *Primula*, native of Western China, where it grows at an altitude of 11,000 to 12,000 feet. Not apparently very easy to cultivate. Scape as figured about a foot long, but described as "3-3.5 (usually not over 15) cm. high" with densely grouped deep indigo to purple small cupulate flowers.—F. J. C.

Prunus cantabrigiensis. By O. Stapf (*Bot. Mag.*, t. 9129; Jan. 1928).—Syn. *P. pseudocerasus* Koidz. A tall shrub long cultivated at Cambridge under the name *P. pseudocerasus* and often referred to thus, but differing from Lindley's *P. pseudocerasus* grown at Chiswick. This has rosy-pink flowers almost in umbels of 3 to 6 flowers, flowering early and rarely fruiting.—F. J. C.

Ranunculus Ficaria grandiflorus F. Schultz. By W. B. Turrill (*Bot. Mag.*, t. 9199; May 1930).—Native of the Mediterranean basin, with larger flowers than the native plant. A long synonymy is given. Capable of flourishing under drier conditions than the British varieties.—F. J. C.

Rheum palmatum dissectum Stapf (*Bot. Mag.*, t. 9200; May 1930).—The type species is the rhubarb of the older Pharmacopoeias and is native in the mountains east of Koko Nor. Przewalski found it in other mountains to the south and introduced it to St. Petersburg, whence it was distributed. This form has foliage more deeply divided than the older plants possessed, and deep red flowers borne in tall panicles up to 8 feet in height. It should prove hardy in most parts of the country.—F. J. C.

Rhododendron Griersonianum Balf. f. et Forr. By O. Stapf (*Bot. Mag.*, t. 9195; May 1930).—A pyramidal shrub with narrow lanceolate leaves and brilliant red funnel-shaped flowers, in June. Rather tender. Native of Yunnan-Burmese frontier.—F. J. C.

Rhododendron hedyosum Balf. f. By O. Stapf (*Bot. Mag.*, t. 9202; May 1930).—A dwarf species about 7 inches high, with white, clustered flowers and lanceolate, deep green leaves, rusty brown on lower surface. Nearly related to *R. cephalanthum*. Native of W. Szechuan. Introduced along with *R. Sargentianum* by E. H. Wilson.—F. J. C.

Stem Eelworm, Tylenchus dipsaci, The : Observations on its Attacks on Potatoes and Mangolds with a Host-list of Plants Parasitized by it. By T. Goodey (*Jour. Helminthology*, vol. vii. No. 4, Dec. 1929, pp. 183-200; 1 plate).—The first part of the paper deals with the infection of Potatoes by *T. dipsaci*, and is divided into three sections, viz.: (i) Introduction, which includes an historical review of records; (ii) Field Pot Experiments at Winches Farm, Herts; and (iii) Observations on the Pathology of the species.

Recent knowledge has shown the method by which the parasite attacks the tissues of its host and the particular elements which are most affected. It is stated that the eelworms cause a dissolution of the middle-lamella substance between the cortical or parenchymatous cells whereby the latter become easily separated from one another. Microscopical observations have shown clearly that the cement which normally holds healthy cells together very largely disappears from between the cells composing this portion of tissue. The eelworms occupy the intercellular spaces between the loosened cells, and the glistening appearance of the affected tissues is probably due to the increased amount of air, for as the cells become separated from one another the volume of air space is increased.

The second part of the paper deals with the infection of Mangolds by the stem eelworm. A review of earlier records is given in Section I, whilst Section II is devoted to a description of the symptoms of attack and an account of pot and field experiments.

The last part includes a host-list of 126 species, the tabulation being host plant, common name, natural order and authority and date.—G. F. W.

Strawberry Growing (Selectie van Aardbeien). By I. A. M. Sprenger (*Lab. voor Tuinbouwpl.*, 13, July 1930; figs.).—The various types of poor plants met with in strawberry grounds are described and the hypotheses of their cause reviewed. The author concludes that the utmost importance attaches to selection of healthy plants for planting, and that July and August planting is best.—F. J. C.

Sugar-Beet Nematode, Field Studies of. By G. Stewart and A. H. Bateman (*U.S.A. Exp. Sta., Bull.* 195, May 1926, pp. 3-31; 9 figs.).—A brief review is given as to the occurrence of this serious pest to growers of sugar-beet in Europe and America.

Short descriptions are given of the male and female eelworms.

The results obtained of a wide survey of the soils in different areas are set out in a series of tables.

With the exception of crop rotation, all other agricultural practices that normally increase yields were found to be of no avail. A four-years' rotation of beet resulted in an entirely restored yield. The suggested rotation is alfalfa, 3 to 5 years; potatoes, 1 year; sugar-beets (with manure), 1 year; small grain, 1 year; potatoes (with manure), 1 year; and grain (with alfalfa seeded in the spring with the grain or in midsummer after the grain is removed), 1 year.

Soil from beet dumps is the commonest source of new infestations, and care should be taken to see that this soil is not returned to the land or dumped on roads whence wheels and the feet of pedestrians may carry it to the fields.

G. F. W.

Tar-Distillate Wash, The Long Ashton: Field Experiments, 1929. By L. N. Staniland and C. L. Walton (*Jour. Min. Agric.*, vol. xxxvi. No. 9, Dec. 1929, pp. 828-835; 6 figs.).—This paper deals exclusively with the Apple Capsid aspect and its relation to tar-distillate washes.

The trials were carried out at five centres (viz. two in Worcester and one each in Gloucester, Kent, and Devon), using three washes: proprietary wash at 10 per cent., modified Long Ashton wash at 10 and 16 per cent., and Long Ashton wash at 10 and 6 per cent. strengths.

The results are set out in a series of tables which show (i) the percentage number of fruits marked by Capsid Bug, and (ii) the weight of fruit marked and (iii) unmarked by Capsid Bug.

It is recommended that trees which are infested with Capsid Bugs should receive a 10 per cent. strength Long Ashton wash applied during December, January or February. A 6 per cent. strength is sufficient to control aphides, Apple sucker, and caterpillar.—G. F. W.

Tylenchus dipsaci, Kuhn, in Wild Host Plants in South-West England, The Occurrence of. By W. E. H. Hodson (*Jour. Helminthology*, vol. iii. No. 3, July 1929, pp. 143-152; 3 plates).—The important fact that certain common weeds harbour large populations of the stem eelworm is stressed in this paper, which is devoted to the occurrence of *T. dipsaci* in certain wild composites in south-west England.

The four wild hosts are the Seaside Plantain, *Plantago maritima* L.; the Greater Plantain, *P. major* L.; the Ribwort Plantain, *P. lanceolata* L.; and the False Dandelion, *Hypochaeris radicata* L.

Each species of host is considered as to previous records of parasitism, the distribution in the south-west, symptoms of attack and seed dissemination of the nematode.

Infected plantains have so far only been found in close proximity to the coast. Infestation of the false dandelion is also most numerous near the coast, but infected plants have sometimes been found inland and remote from running water.

Seed dissemination of the eelworm occurs in all the host plants considered.

In two localities, infected plantains have been found growing actually in ground devoted to the commercial cultivation of the Narcissus, which is a common host of this nematode. Again, infestations occurred on a beach from which seaweed and sand are regularly carted for the purpose of top-dressing Narcissus beds.

The author concludes with the remark that it is rather difficult to believe that in these cases separate and distinct "biologic strains" of *T. dipsaci* are at work, each incapable of attacking any of the other host plants.—G. F. W.

Watsonia Beatricis Mathews and Bolus. By O. Stapf (*Bot. Mag.*, t. 9139; March 1928).—Rich apricot-red with more and larger flowers than *W. Pillansii*. Native of South Africa.—F. J. C.

EXTRACTS FROM THE PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

FEBRUARY 12, 1929.

Sir WILLIAM LAWRENCE, Bt., in the Chair.

A lecture was given by Mr. Le Suer on "The Beautifying of the Roads by Planting" (see vol. 54, p. 412).

ONE HUNDRED AND TWENTY-FIFTH ANNUAL GENERAL MEETING
held on February 26, 1929, in the Lecture Room of the New Hall,
Greycoat Street, Westminster.

Mr. G. W. E. LODER, F.L.S. (President), in the Chair, supported by the
Members of Council and some hundred and sixty Fellows.

The Secretary read the notice convening the Meeting.

The PRESIDENT: Ladies and Gentlemen,—No assembly of loyal subjects can proceed to the business which has brought them together to-day without first of all giving expression to a profound feeling of relief and thankfulness at the deliverance of our Sovereign, the Patron of our Society, from the protracted illness from which he has been suffering for so long, nor can we withhold a humble meed of sympathy to Her Majesty the Queen in the long anxiety she has suffered, or from offering her a tribute of admiration for the noble example of courage and fortitude which she has shown throughout the King's long illness. (Hear, hear.) We all humbly pray that His Majesty's convalescence, which now seems so happily established, may rapidly lead to his permanent recovery and return to full health and strength. (Applause.)

I pass from that ray of hope and light at the close of a long and anxious winter, I pass in sorrow, to the shadow of the cloud cast over our Society by the death of its President. Ladies and Gentlemen, in Lord Lambourne we have lost not only a great President, but a great friend, respected and beloved by all who knew him, devoted to the welfare of the Society and to the interests of horticulture. I believe it to be true that he was more proud of his position as head of this Society than he was of any other distinctions which he attained in his long and useful life. In the discharge of his duties he brought to bear an exceptional combination of qualities. His geniality and kind-heartedness pervaded all his actions; the genuineness and sincerity of his character was such that Englishmen like to find in their public men, not less amongst those from whom they differ than amongst those with whom they agree in opinion. Anything like harshness or unfairness was utterly foreign to his nature—(Hear, hear)—he was a model Chairman, patient, conciliatory, firm, and fair; we shall miss him sorely, but he has left behind him a host of radiant and happy memories which will long endure, and they will nowhere shine more brightly or endure more lastingly than in the hearts of those who had the privilege of being associated with him in the service of the Royal Horticultural Society. (Applause.) Of him it may truly be said:

"He was a man, take him for all in all.
We shall not look upon his like again."

The Fellows of this Society will all wish that some memorial should be established worthy of the services he rendered, some indication to posterity of the respect in which he was held, and of the gratitude of his contemporaries. Of course it is too soon yet to be able to say what would be the most appropriate form for the memorial to take, but you may rest assured that every proposal will receive careful and respectful consideration.

Finally, I have now the honour to move a Resolution which the Council have drawn up, knowing that you would all wish to-day at this Annual Meeting to place on the rolls of the Society a record of the regret you feel at the loss the Society has suffered, and I would ask you, when I have read it, to signify your respectful assent by rising silently in your places:

"The Royal Horticultural Society, at this the Annual General Meeting of its Fellows, desires to place on record its deep sorrow and regret at the death of its late President, the Right Hon. Lord Lambourne, P.C., G.C.V.O., V.M.H. It will always remember with gratitude the great services which, by his tactful conduct of its affairs, by his great love for Horticulture, and above all by his geniality, he has rendered to the Society, and which have contributed so largely to its marked advance during his ten years of office. The Royal Horticultural Society would beg respectfully to tender to Mr. Robert Lockwood and the other members of his family its sincere sympathy in the loss they have sustained."

The Vote of Sympathy was passed by the meeting rising and standing in silence.

The PRESIDENT: I understand that the Minutes of the last Annual Meeting have been printed and circulated, and I have to ask your formal approval of the same and your assent to my signing them.

It was agreed.

The PRESIDENT: It is now my duty to submit to you the Report of the Council for the year 1928.

It is gratifying to be able to record another year of continued progress. The roll of Fellows, after allowing for deaths and withdrawals, has increased by 1,100 and the total number is now in the neighbourhood of 26,500. The finances of the Society are sound, but I shall leave our Budget in the competent hands of the Treasurer, Mr. Musgrave, to unfold. The activities of the Society are continually expanding, but as I shall have to refer later on to some of the consequences of this expansiveness, I will not enter into details at the moment. I must, however, remark that, satisfactory as it is for the Society, it is even more so when we realize the evidence it affords of the ever-increasing hold which horticulture has to-day on all sections of the community. This is further reflected in the growth of the number of affiliated Societies, now numbering over 600; in the increasing number of Societies and Shows concerned with the cultivation of particular flowers; in the greater attention and taste exercised by Municipal Authorities and other public bodies in the arrangements of gardens under their charge, a conspicuous example of which is afforded by the parks and gardens in London; in the endeavour in some measure to clothe the nakedness of our new roads; in the desire to preserve the charm of open spaces; and in the continuous flow of expeditions to every corner of the globe in search of new things.

It may, in fact, be affirmed that, widely as the art of gardening was pursued at different periods in Italy, Holland, France, and the East, at no time and in no country has man's desire to adorn his surroundings with Nature's gifts, or his efforts to improve the fruits of the earth, been more widespread than they are amongst the inhabitants of these islands to-day.

To foster, to guide, and to stimulate this great and beneficial movement is the high aim and aspiration of this Society, and in the pursuance of that endeavour it gratefully acknowledges the assistance of Science on the one hand and of Commerce on the other.

To Science we turn for help to combat disease, to unravel the mysteries of plant growth, and to classify and name our plants intelligibly, while to Commerce we look to propagate, to popularize and distribute them.

The outstanding event of the past year was the opening of the New Hall by H.R.H. Princess Mary, on June 26, in the presence of a distinguished gathering of Fellows and friends of the Society.

It marks an epoch in the history of the Society, as did the erection of the older buildings twenty-five years ago, and thus, after many years of anxious thought and of careful balancing of conflicting advantages and disadvantages,

the Society is in possession of a Hall of ample dimensions, which we trust will satisfy all reasonable demands for many a long year to come.

I cannot forbear at this the first Annual Meeting after its completion from once more testifying what the Society owes to the Housing Committee, and especially to its Chairman, Mr. Musgrave. (Applause.)

The Architects, Messrs. Easton & Robertson, are warmly to be congratulated on the accomplishment of an edifice not only finely adapted for its purpose, but which has won the unstinted commendation of the Architectural profession.

As so much interest is naturally taken by the Fellows in the New Hall, perhaps you will allow me to give you a few figures. The total cost to December 31 last was £145,000, which I am glad to say we have met from our own resources. There remains a sum of about £20,000 to be defrayed, which sum we have in hand. To have been able to erect and equip such a building without having recourse to borrowing, speaks well for the financial stability of the Society and the foresight of our predecessors. I may further inform you that we have already set up a sinking fund which will enable the Society gradually to write off the cost of the Hall. At the same time, it is as well to remind you that its maintenance, though much less than a steel structure would have cost, will involve considerable expense; against which, however, I am glad to say that the prospect of a substantial income from lettings is already assured.

It was, I venture to think, a happy inspiration to inaugurate, so to speak, the New Hall by holding in it an International Exhibition of Garden Design, for, by universal consent, no structure could have been more suitably adapted for such a display, and the Hall lent itself admirably for the purpose.

The Exhibition was opened by the Earl of Crawford and Balcarres and was visited by 16,000 persons. The Council desire to record their thanks to Sir William Lawrence, who worked very hard during the whole of the preparations as the Chairman of the Exhibition Committee; to Mr. Reynolds-Stephens, who was responsible for the layout of the Sculpture Section; to Mr. Avray Tipping, for the Historical Section; and to Mr. G. H. Jenkins, who was the nominee of the Royal Institute of British Architects, all of whom laboured indefatigably to secure the success of the Exhibition.

The Conference was likewise well attended, and the Papers read were listened to by crowded audiences. The Council wish to tender their thanks to Monsieur Duchêne, Dr. Camillo Schneider, Mr. J. R. Köning, and Mr. Leonard Barron, who made long journeys from overseas to be present, and delivered instructive and illuminating addresses.

The thanks of the Society must further be extended to the Societies and Institutions of America, Belgium, Holland, France, and Germany for coming forward and assisting in the Foreign Section of the Exhibition; and lastly it wishes to thank the Governments of Australia, South Africa, and New Zealand for their interesting exhibits.

A record of the Conference will be published in the July number of the Society's JOURNAL.

Deputations.—The "Floralies Gantoises," being the quinquennial exhibition of the Société Royale d'Agriculture et de Botanique de Gand, was visited and a number of awards were given. At home the Harrogate Agricultural Society's Show was visited and a number of medals awarded.

This year the Council are sending deputations to the Cornwall Spring Flower Show in April and to the Centenary Show of the Norfolk and Norwich Horticultural Society in July.

Autumn Shows.—The Autumn Show was held in both the Old and the New Halls, and the contrast in the setting with the Shows held in the Holland Park Skating Rink in recent years was very striking—so great, however, is the demand for space at that season that the Council have decided to hold the Autumn Show this year in four portions, two days being allotted to each, in order that more space for the Exhibitions and better accommodation for Fellows and visitors can be given. There will be a two days' show on September 19 and 20, *principally* for open-air plants and Roses; a two days' show on October 2 and 3, *principally* for ornamental trees and shrubs; a two days' show on October 8 and 9, *principally* for fruit and vegetables; and a two days' show on October 23 and 24, *principally* for Orchids, stove and greenhouse plants.

Wisley.—The work at Wisley, details of which are set forth in the Report, has been carried on. The Council have to thank the bulb-growing industry for appointing a research worker in problems connected with the growing of bulbs.

The open space adjacent to the Rock Garden has been greatly improved by the addition of some bold rocks and appropriate plants. This we owe largely to the initiative and generosity of our colleague, Mr. Mark Fenwick, who takes so keen an interest in the Garden. (Hear, hear.)

Educational Work.—The School of Horticulture has its full complement of students, and the Scholarships have been well competed for. The examinations of the Society continue to be carried on successfully and give satisfaction.

Expeditions.—The Society took shares in the expeditions of Mr. Clarence Elliott to Southern Chile, of Captain Kingdon Ward to Upper Burma and the marches of Tibet, and of Miss Hutchison to Greenland.

An important event in the Horticultural world will take place in 1930, to which I ought to make some preliminary allusion.

International Horticultural Congress in 1930.—The Council invited the International Horticultural Congress, when sitting at Vienna in 1927, to meet in London in 1930. A Committee has been formed for dealing with the organization of the Congress, and subjects of great horticultural interest will be discussed.

Fellows who take an interest in the Congress are requested to communicate with the Secretary for particulars.

Followed as it will be by the International Botanical Congress at Cambridge, it is anticipated that a very distinguished body of horticulturists will be gathered together from all parts of the world.

I have now to direct your attention for a few moments to a problem which has exercised the ingenuity of the Council for a long while, the solution of which is long overdue, namely, the best method of providing the necessary accommodation to meet the requirements of the increasing numbers of Fellows and of the Administrative Staff.

It is hardly necessary for me to trouble you with evidence in order to bring home to you how pressing the matter has become, and how cramped we are at present. But I have asked the Secretary to get out certain figures for me which I think you would like to have, and here they are: In 1904, when the older building was opened, that is twenty-five years ago, there were 8,500 Fellows; there are now upwards of 26,500. As an indication of the increase in correspondence, I may say that the postage bill at that time amounted to £340; it is now over £1,000. In those days there were no lettings to deal with; they now entail a considerable amount of work and correspondence, and the demand for Committee rooms for various purposes has greatly increased.

Twenty-five years ago nine persons all told were able to carry on the work at Vincent Square. To-day a staff of twenty-six can scarcely cope with it.

In addition to all this the Library has long outgrown its capacity. When it was first housed in its present abode there were about 4,000 books; to-day they number upwards of 12,000.

We are also faced with the danger that the letting value of the Old Hall will decline unless its amenities are brought up to the standard of modern requirements.

It was known, of course, when the site of the New Hall was decided on, that it was not spacious enough to allow of the necessary office accommodation being built upon it; that had to be sacrificed, the paramount consideration being the size of the Hall itself, and though it has been possible to provide a Lecture Room and a certain number of suitable Committee rooms, the problem of the offices was left unsolved.

Several schemes have been prepared, examined, and criticized, and the proposal now before you has been decided on after many prolonged consultations. The chief features of the scheme are the addition of a floor on the top of the building for the accommodation of the Library, to convert the Library into offices, and to reconstruct the basement in order to provide space for improved cloak-room and lavatory accommodation. The plans are exhibited on the walls to-day. It only remains to add that the estimate for these alterations amounts, as far as we can tell at present, to about £16,000 or £17,000, which, taking all the circumstances into account, cannot be regarded as excessive.

Acknowledgments.—The Council's thanks are due to sundry benefactors for their donations of books, plants, seeds, etc., more especially to the Iris Society for its generosity in presenting the original drawing for Mr. Dykes' book on "The Genus Iris."

We mourn the loss of several Fellows who had rendered conspicuous service to the Society. Foremost amongst them Sir William Thiselton-Dyer, at one

time Director of Kew and a member of Council; Major-General Sutton, who, as Deputy-Governor of Chelsea Royal Hospital, was always friendly and helpful in negotiations, sometimes of a delicate nature; Mr. Charles Lucas, an active member of Committees and former member of Council; Mr. Brooman White, Mr. J. J. Cypher, and Mr. H. J. Jones, all of whom will be greatly missed. It was a deep sorrow to us all that Mr. Frank Reader, so long the Chief Cashier, who had devoted thirty years of faithful service to the Society, passed away shortly after his retirement.

To the retiring members of the Council our warmest thanks are due. Mr. Charles Nix and Mr. George Monro are too well known to you to need praise from me, they have given freely of their valuable time and experience; while Dr. Hill, the distinguished Director of Kew, who rejoined the Council a few months ago under the provisions of the new Charter, has been good enough to allow himself to be re-nominated for another term.

I cannot conclude without paying a warm tribute, in which I am sure you will all heartily join, to the work of the Staff. The growth of the Society's activities, to which I have already alluded, now taxes to the utmost the energies of our officers. Under the able guidance of Colonel Durham, however, a spirit of harmony and efficiency prevails which ensures the accomplishment of much labour, to the credit of the Society and to the satisfaction of all concerned. (Applause.) I now formally move the adoption of the Report, and will call upon the Treasurer to second the Resolution, and give you a statement of the finances of the Society.

In seconding the adoption of the Report, Mr. MUSGRAVE said :

I am happy to be able to report to you that the financial position of the Society is quite sound and satisfactory. The Accounts which are in your hands, and the Book of Arrangements, show a somewhat different state of affairs from those of last year; that is to say, we have converted our investments in Stocks and Shares into this New Hall, and there is now no General List of Investments of the Society in the Accounts.

The position, however, is none the less sound, and we have been able so far to provide for the whole of the payments in respect of the Hall without borrowing a penny. (Applause.)

He also referred to the desirability of again starting a reserve fund as soon as possible, and dealt with several points arising on the Accounts, drawing attention to the new sub-account in respect of the Restaurant.

He also pointed out the necessity for providing further accommodation for the Staff.

Having invited questions, the President then put the motion, which was carried unanimously.

Mr. Loder then left the Chair, and his place was taken by Mr. Musgrave.

Mr. MUSGRAVE: We now come to the election of the President. Mr. Loder has been proposed and elected *ad interim* President of the Society by the Council in accordance with the rules and regulations of the Society. No other nomination has been received, and I put it to you now to confirm his appointment.

The resolution was carried with acclamation.

Mr. LODER: Ladies and Gentlemen, Fellows of the Royal Horticultural Society,—I thank you from the bottom of my heart for the very great honour that you have done me in confirming my election as President of this great Society. I feel the honour a very high one indeed.

In the few remarks I made just now I enlarged to some extent on the great hold which Horticulture has on the people of this country at the present day, and it cannot but be a very proud position for a man to find himself at the head of the greatest Horticultural Society in this country. I feel at the same time that the responsibilities are exceedingly heavy, especially coming after so popular and so efficient a President as Lord Lambourne, who occupied this Chair so ably for the last ten years. I shall do my best to fulfil those responsibilities, but I cannot help feeling conscious of my want of qualifications for the tasks which fall to the duty of the President. I am, however, very much encouraged by the exceedingly kind reception which you have given me here this afternoon, and by the many indications of a friendly and encouraging character that I have received from Fellows in all parts of the country. I can only say, in thanking you once more, which I do most sincerely, for the great position which you have put me into, that it will be my highest endeavour and my greatest pride to maintain the high traditions of this Society. I thank you all very much for the honour you have done me. (Loud applause.)

I do not think that I could have any task more agreeable than my first one after confirmation of my election as your President, and that is to ask you to re-elect our friend Mr. Musgrave as Treasurer of the Society. (Applause.)

Mr. Musgrave has held the position during very anxious times when we have had a great deal going on, and by being Treasurer has not in the least degree done less work as an ordinary member of the Council. On the contrary, he has taken on his shoulders such trifles as the management of the new Charter and Bye-laws, and many other matters of that kind, so that it is not only as Treasurer that we have to thank him, but as a most efficient and valuable member of Council. I have the greatest possible pleasure in proposing that Mr. Musgrave be re-elected as Treasurer. I believe it is customary, if no objection is raised, that we should at the same time place before the meeting the members of Council who are to take the place of the retiring ones; we have only received the same number of nominations as there are vacancies. We will also take the Vice-Presidents, to whom no objection has been raised.

The nominations to the Council in place of the retiring members are Mr. E. A. Bunyard, Dr. A. W. Hill, and the Hon. H. D. McLaren. Our Vice-Presidents, all of whom bear very well-known names, which you have been accustomed to see at the head of our Report for many years—you will not want me to read them all out; they are quite familiar to you all.

Mr. A. C. Harper has been proposed as the official Auditor.

I should like to propose that all the following nominations be accepted.

<i>As Treasurer.</i>	<i>Proposed by</i>	<i>Seconded by</i>
Mr. C. T. Musgrave, V.M.H.	Mr. C. G. A. Nix.	Dr. A. W. Hill.

As Members of Council.

Mr. E. A. Bunyard, F.L.S.	Mr. Wm. Cuthbertson.	Mr. E. A. Bowles.
Dr. A. W. Hill, C.M.G., M.A., F.R.S., F.L.S.	Mr. G. Monro.	Mr. R. D. Trotter.
The Hon. H. D. McLaren, C.B.E., J.P.	Mr. G. W. Leak.	Mr. T. Hay.

As Vice-Presidents.

The Duke of Bedford, K.G., F.R.S.	} Mr. W. R. Oldham.	} Mr. T. Hay.
The Duke of Portland, K.G., P.C., G.C.V.O.		
The Viscount Ullswater, G.C.B.		
Sir James Knott, Bt.		
The Rt. Hon. Sir Herbert Maxwell, Bt., P.C., D.C.L., LL.D., F.R.S., V.M.H.		
Sir Daniel Morris, K.C.M.G., J.P., D.Sc., D.C.L., F.L.S., V.M.H.		
Lt.-Col. Sir David Prain, C.M.G., C.I.E., LL.D., F.R.S., F.L.S., V.M.H.		
The Hon. Vicary Gibbs, V.M.H.		
Mr. E. A. Bowles, M.A., F.L.S., V.M.H.		
Mr. J. C. Williams.		

As Auditor.

Mr. Alfred C. Harper.	Mr. C. T. Musgrave.	Mr. C. G. A. Nix.
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Mr. HANBURY: I shall be very pleased to second that.

The President declared all the nominations to be duly elected.

The following Presentations were then made by the President:

The Victoria Medal of Honour.—To Mr. Alexander Malcolm, the well-known amateur raiser of Sweet Peas; Mr. W. Atkinson, the managing director of Messrs. Fisher, Son & Sibray, of Sheffield.

The Lawrence Medal.—To the Hon. Vicary Gibbs, for his exhibit of vegetables on October 9, 1928.

The Veitch Memorial Medals.—Gold Medal and £50 to Miss Gertrude Jekyll, in commemoration of her services to horticulture and gardening, Col. Sir Herbert Jekyll, K.C.M.G., receiving the medal on her behalf; Gold Medal to Mr. C. G. A. Nix, for his services to the Society; Silver Medal and £50 to Mr. John Fraser, for his work on Pelargoniums, Salix, and Mentha; Silver Medal to Mr. Samuel Smith, of The Gardens, Penjerrick, Falmouth, for his work in hybridizing Rhododendrons; Silver Medal to Mr. W. Reynolds-Stephens, for

his work in connexion with the Sculpture Section of the International Exhibition of Garden Design on October 17-24, 1928.

The Cory Cup.—To Mr. F. C. Stern, for his *Rosa highdownensis*, which was judged to be the best hardy plant of garden origin shown to the Society during 1928.

The Loder Rhododendron Cup.—To Professor Wright Smith, in recognition of his very valuable work on Rhododendrons and Azaleas.

The George Moore Medal.—To Mr. R. Paterson, for *Cypripedium* 'W. H. Moore,' 'Stonehurst' variety, which was considered to be the best new *Cypripedium* shown to the Society during 1928, Mr. Merry receiving the medal on his behalf.

The Sander Medal.—To Baron Bruno Schröder, for *Amaryllis* 'Baroness Schröder,' which was considered to be the best new greenhouse plant shown to the Society during 1928. (Unable to be present.)

The Williams Memorial Medals for the best groups of plants of one genus showing excellence in cultivation : to Lady Aberconway and the Hon. H. D. McLaren, for their exhibit of *Primulas* staged at Chelsea, 1928; and to Messrs. Sutton & Sons, for their exhibit of *Cyclamen* staged on February 28, 1928.

Mr. HANBURY : I have great pleasure in proposing on your behalf a hearty vote of thanks to our Chairman and new President.

In proposing the vote of thanks I should like to congratulate the Society on having secured so efficient and well known an enthusiast in horticulture for President. His qualifications are well known to you all, he has a great knowledge of botany, a splendid library, and everything that could help to make the work efficient. (Applause.)

Mr. CHEAL : I have very great pleasure in seconding the vote of thanks. Our new President has always been known for his willingness to serve the Society, and we feel that an honour has been conferred upon us. We are quite sure Mr. Loder will always, as he has done in the past, take the greatest interest in horticulture, and in the welfare of this Society.

Mr. WALLACE : May I be allowed to support the vote for one or two vital reasons. In the first place, Ladies and Gentlemen, may I add my congratulations to those that have gone before on the election of our new President. My mind goes back some years—some of us will remember that what was, I am sure, a great political loss at one time to the Conservative Party, is now to-day a great horticultural gain to the horticulturists of Great Britain, and nowhere has it been more manifest than in the eloquent, moving, and earnest words of the President when he voiced the feelings of the Fellows with reference to the King and to our late President; you can only imagine those words in another place uttered in the same manner and you will realize at once the prize that we as horticulturists have gained in our new President.

May I be allowed to offer the congratulations of the trade and assure you that from the exhibitors of the Royal Horticultural Society you will always receive the same support and regard and affection as they have bestowed upon their late President. I feel sure there is one more record that our new President has at once made. I do not remember one single Annual Meeting that I have attended before at which no single question has been raised and no criticism passed when the Report has been put from the Chair. I congratulate you. (Applause.)

Mr. MUSGRAVE : Will those who support the motion signify their support in the usual manner? (Loud applause.)

The CHAIRMAN : I thank you very much for your kindly motion which you have just passed, and Mr. Hanbury and Mr. Cheal for the kind things they have said.

I was rather afraid my friend Mr. Wallace was going to be a little out of order; he approached very near to a subject of which we generally disapprove in these meetings. I can only say I do not deserve half the kind things he has said.

In conclusion I repeat any efforts of mine will only be successful if I can count upon the co-operation and the goodwill of the Fellows of this Society. It will be my great aim and object to attain that, and I hope when we meet here again we may have as satisfactory a year to report on as we have had in 1928. (Applause.)

REPORT OF THE COUNCIL FOR THE YEAR 1928.

It is with profound regret that the Council has to record the death of the President, The Right Hon. Lord Lambourne, P.C., G.C.V.O., V.M.H.

Joining the Society as a Fellow in 1904, Lord Lambourne became a member of the Council in 1914, and five years later was elected President of the Society. To its service he brought the authority of his great position, a wide experience of men and affairs, a deep love of horticulture, and, not least, the gift of inspiring affection in all who worked with him. The ten years of his Presidency will remain memorable in the history of the Society, and the progress made owes a little to the ability and tact with which he directed its affairs.

The Society, and Horticulture in general, owe to Lord Lambourne a debt of gratitude and devotion which cannot be readily measured.

1. **Grant of the Charter of 1928 and Bye-laws.**—The new Charter for the Society and the Bye-laws were granted under Royal Warrant on the 9th day of July, 1928, on which date the Bye-laws came into force. Dr. A. W. Hill, F.R.S., Director of the Royal Botanic Gardens, Kew, was appointed the additional member of Council.

2. **Patron.**—H.R.H. Princess Mary, Viscountess Lascelles, has graciously consented to become a Patron of the Society.

3. **The Year 1928.**—The progress of the Society has been maintained throughout the year, and the growth of Fellowship is steady and encouraging.

4. **Obituary.**—The Society has again to regret the loss of many valuable friends, among whom may be mentioned: Sir William Turner Threlton-Dyer, F.R.S., who will be remembered as a great botanical administrator. He acted as Professor of Botany to the Society in 1872 to 1875, and took an active interest in its affairs as a Member of Council for many years; and Major-General H. C. Sutton, C.B., C.M.G., Secretary of the Royal Hospital, Chelsea, who took an active interest in the Society's arrangements for its Great Spring Show. Two holders of the Victoria Medal of Honour have passed away—Mr. H. J. Jones and Mr. J. J. Cypher, who will be remembered for their fine exhibits at the Society's meetings, and their keen interest in the work of its Committees. The Society has lost three valuable friends in Mr. C. J. Lucas, Mr. R. Brooman White, and Mr. John Basham. Mr. Lucas had served many years on the Council, and was an enthusiastic member of the Orchid Committee; Mr. Brooman White, was an enthusiastic Orchid grower, and had served on the Society's Committees for thirty years; and Mr. Basham was ever ready with his advice as member of the Fruit and Vegetable Committee. It was with great regret that the Society learned of the death of Mr. Frank Reader, the former Chief Cashier of the Society, who had retired just before the Annual Meeting in 1928.

5. **The New Hall.**—The New Hall was opened by Her Royal Highness Princess Mary, Viscountess Lascelles, on June 26, in the presence of a large company of distinguished guests, Fellows, and friends of the Society. A full description of the ceremony is published in the JOURNAL.

6. Numerical Progress.—

LOSS BY DEATH IN 1928.				FELLOWS ELECTED IN 1928.			
Life Fellows	..	..	9	Life Fellows	..	..	28
Honorary Fellows	..	..	3	4 Guinea Fellows	..	..	24
4 Guinea Fellows	..	..	6	2 " "	..	..	1,580
2 " "	..	..	202	1 " "	..	..	866
1 " "	..	..	141	Affiliated Societies	..	..	62
Associates	..	..	4	Associates	..	..	94
			365				2,654
LOSS BY RESIGNATION, ETC.				Deaths and Resignations	..	..	1,557
4 Guinea Fellows	..	..	15	NET INCREASE	..	..	1,097
2 " "	..	..	539	Total on November 15,			
1 " "	..	..	541	1927	..	..	*25,259
Affiliated Societies	..	..	49	Total on November 13,			
Associates	..	..	48	1928	..	..	26,356
			1,192				
TOTAL LOSS	..	..	1,557				

* An adjustment of the total fellowship of the Society (25,004 in 1927) has now been made by a recount of the card index.

7. **The Fortnightly Meetings.**—The Fortnightly Meetings have been well attended. It is gratifying to note that the lectures have been better attended than in past years.

8. **The Daffodil Show.**—The Daffodil Show was even better supported than in 1927. It is hoped that with the better accommodation that the New Hall will afford, the Show will continue to grow in importance and popularity.

9. **The Chelsea Show.**—The improvements introduced in the arrangements for the Great Spring Show appeared to be appreciated by the visitors. The tent accommodation was increased. The principal feature was the display of Primulas staged in connexion with the Conference on that genus. The attendance this year was not as great as in the previous year, owing to the unfavourable weather. The Show itself was in every way excellent, and the quality of the exhibits of a high standard.

10. **The Primula Conference.**—The Primula Conference held in connexion with the Chelsea Show was well attended. Sir David Prain and Mr. E. A. Bowles took the Chair at the meetings. The Society's thanks are due to the readers of the many interesting papers. The full report of the Conference will be published in the JOURNAL. The exhibits of Primulas, especially those of the Lady Aberconway and the Hon. H. D. McLaren, were of special interest.

11. **The Commemoration Cup.**—The Commemoration Cup which was offered in commemoration of the opening of the New Hall, for the best exhibit of stove and greenhouse plants on an area not exceeding 300 square feet, was awarded to the firm of Messrs. L. R. Russell, Ltd.

12. **The Sherwood Cup.**—The Sherwood Cup for the best exhibit in the Show was awarded to the Hon. Vicary Gibbs, for his exhibit of vegetables.

13. **The Amateurs' Show.**—The fourth Amateurs' Show was well supported, and the Old Hall barely provided accommodation for the exhibits. It was held on the opening day of the New Hall, and Her Royal Highness Princess Mary, Viscountess Lascelles, visited the Show. In 1929 the Show will be held on July 9.

14. **The Fruit Competitions.**—The Fruit Competitions for Cherries, Gooseberries, Currants, Raspberries, etc., and for Peaches, Plums, Early Apples, etc., were held on July 17 and August 28 respectively. The Council, however, regret to announce that the interest shown in these competitions does not appear to warrant their repetition in 1929. The National Farmers' Union, however, is staging a special Cherry Show on July 16, 1929.

15. **Autumn Show.**—The Autumn Show occupied both Halls. It was the first Show to be held in the New Hall, and gave the visitors an opportunity of seeing how well the Hall suited itself to the Society's Exhibitions. The application for space greatly exceeded the capacity of the two Halls together. The standard of the exhibits was high, and the Roses were specially noteworthy. In view of the popularity of the Show at this time of year, and the difficulty of accommodating to the full extent the great variety of plants, the Council have decided in 1929 to break up the Autumn Show into a series of shows, to be held in both Halls: a two days' show on September 19 and 20, primarily for open-air plants and Roses; a two days' show on October 2 and 3, primarily for ornamental trees and shrubs; on October 8 and 9, a show primarily for fruit and vegetables; and on October 23 and 24, a show primarily for Orchids, stove and greenhouse plants.

16. **Fruit and Vegetable Show.**—The Fruit and Vegetable Show was held as a combined show on October 9, and was well supported. The display of fruit was particularly fine, and occupied the body of the New Hall, whereas part of the Vegetable Section had to be staged in the Restaurant. In 1929 the Fruit and Vegetable Show will be extended to a two days' show at the request of the exhibitors, and will be held on October 8 and 9.

17. **International Exhibition of Garden Design and Conference on Garden Planning.**—The Exhibition of Garden Design, with its Conference on Garden Planning, was held in the Society's Old and New Halls from October 17 to October 24. The Exhibition, which was opened by the Right Hon. The Earl of Crawford and Balcarres, was well patronized and visited by over 16,000 persons. The Council wish particularly to record their thanks to Sir William Lawrence, Bt., Chairman of the Exhibition Committee; to Mr. Reynolds-Stephens, P.R.B.S., who was responsible for the lay-out of the centre of the Hall and the Sculpture

Section; to Mr. H. Avray Tipping, for the Historical Section; and to Mr. G. H. Jenkins, F.R.I.B.A., who was the nominee of the Royal Institute of British Architects. The Conference was very well attended, and the Council wish to record their thanks to Monsieur Duchêne, Dr. Camillo Schneider, Mr. J. R. Köning, and Mr. Leonard Barron, who came from abroad to give interesting lectures at the Conference. The Council further wish to extend their thanks to the Societies in America, Belgium, Holland, France, and Germany for coming forward and assisting in the Foreign Section of the Exhibition, and particularly they wish to thank the Australian, South African, and New Zealand Governments for their exhibits. The record of the Conference will be published in the July JOURNAL of the Society.

18. **Special Competitions: Culinary Peas, Walnuts and Cobnuts.**—A competition for Culinary Peas will take place on July 16. With the kind co-operation of the Ministry of Agriculture, a competitive display of Walnuts will be staged on November 19, in order to rouse interest in the cultivation of this fruit. A competitive display of Cobnuts will also be exhibited on this occasion.

19. **Deputations.**—The "Floralies Gantoises," quinquennial exhibition of the Société Royale d'Agriculture et de Botanique de Gand, was held on April 21 to 29, and the Council sent a deputation consisting of Sir William Lawrence, Bt., Mr. W. R. Oldham, and Mr. G. Monro.

The following awards were made:

Gold Medals were awarded to Messrs. Van Houte, Ltd., Lapint, for specimen stove plants; to Messrs. Sanders, Bruges, for Orchids; to M. Th. Pauwels, Meirelbeke, for Orchids; to M. Vermaercke-de-Meyer, Gandbrugge, for Orchids; to MM. Flandris, Bruges, for *Azalea indica*; to M. Th. Piens, Meller, for *Azalea indica* 'Apollo'; to The Aalsmeer Growers, Aalsmeer, for a collective exhibit of cut Lilac, Roses and Cherries; to MM. Vilmorin Andrieux et Cie, Paris, for a collective exhibit; to M. C. G. van Tubergen, jun., Haarlem, for Lilies and Bulbous Plants; to The Central Committee of Bulb Growers of Holland, for a display of cut Tulips.

Further, the Council sent a deputation consisting of Mr. L. G. Sutton, Mr. Hay, and the Secretary to the Harrogate Agricultural Society's Show on August 10, and the following awards were made:

Gold Medals to the Corporation of Harrogate, for a mixed group; to Messrs. A. Dickson & Sons, Ltd., Newtownards, Co. Down, for Roses; to Messrs. Saml. McGredy & Son, Royal Nurseries, Portadown, N. Ireland, for Roses; and to Messrs. Sutton & Sons, Reading, for a mixed group.

Veitch Memorial Medals.—Silver Veitch Memorial Medal and £5 to Dr. W. L. Spink and Mr. C. F. Spink, North Dene, Balmoral Avenue, Gt. Yarmouth, for a group of plants. Bronze Veitch Memorial Medal and £2 10s. to Mr. R. Jones, The Gardens, Clova, Harlow Oval, Harrogate, for Begonias. Silver Flora Medals to Colonel C. F. Tetley, D.S.O., Kirkman Bank, Knaresborough, for a show of flowers, fruit and vegetables; and to Major F. H. Fawkes, Farnley Hall, Otley (Head Gardener, E. M. Mutlow), for pot Apples. Bronze Flora Medal to Mr. J. K. Woodmansey, Ye Old Manor House, Knaresborough, for Ferns.

In 1929 the Council has accepted the invitation to send a deputation to the Cornwall Spring Flower Show on April 23 and 24, and to the Centenary Show of the Norfolk and Norwich Horticultural Society on July 11 and 12.

20. **Wisley.**—The Society's Garden is now, by means of the network of omnibus routes covering Surrey, much more easy of access than when the Society first entered into possession, and this access has been further improved during the year by the acceleration of the service between Kingston and Guildford. The attention of Fellows is drawn to the means of reaching Wisley set out in the Book of Arrangements. A map of the Garden, showing the disposition of its principal features, has been prepared, and it is hoped visitors will find this useful.

The Garden is being increasingly used by Horticultural Societies and parties of gardeners for visits in search of information, as well as by Fellows. These organized visits give opportunities for discussion of many things seen by the visitors, and are of decided educational value. Each year also sees a larger number of visitors from abroad, and many on their return send things to the Garden to be grown there, especially those visitors from British Dominions overseas.

21. **Experimental Work.**—The various items of experimental work mentioned in the last report have been pursued, and the necessary buildings and apparatus have been constructed for the new lines of work begun. A report of Mr. Tincker's

work on the influence of the length of daily exposure to light upon growth and reproduction of plants will shortly appear in the JOURNAL. The preliminary work in connexion with the new experiments on the effect of various soils upon plant growth has also been carried out. Dr. Darbishire has continued his investigations on the influence of chemical solutions on the production of roots in cuttings, and with Mr. Buxton on the connexion between acidity of sap and flower colour, on which a report appears in the JOURNAL. Experiments designed to test the effect of various manurial treatments on the attacks of black spot on Roses, various diseases of Gladioli, etc., are in progress. A new insect attack upon Rhododendron has been investigated by Mr. G. F. Wilson during the year, and preliminary reports have been published. The work on fruit pollination is being continued.

22. **Bulb Research Scholarship.**—The funds for the salary of a research worker in bulb-growing problems have been provided by a number of Fellows especially concerned in this branch of horticultural industry, and Mr. J. Wood has been appointed to the scholarship which is tenable for two years. He has investigations in progress in connexion with the hot-water treatment of bulbs, and with diseases of Tulips, Gladioli, etc.

23. **Mycologist.**—Mr. Dowson, upon whom the degree of D.Sc. (London) has recently been conferred as a result of the work carried out at Wisley, having been appointed Mycologist to the Government of Tasmania, Mr. D. Green, M.Sc., late of Leeds University, has been appointed Mycologist at Wisley in his stead. He is investigating a mildew of the genus of *Meconopsis* and related plants, and other plant diseases.

24. **Ultra-violet Ray Glass.**—During the past two years comparisons have been in progress between plants grown under vio-ray and vita-glass and those under ordinary glass. A report will be published in the JOURNAL in due course, but the general results show little in favour of the use of ultra-violet ray glasses for crop growing.

25. **Analyses, etc.**—There has been a slight increase in the number of soil and manure analyses carried out for Fellows. Large numbers of tests of insecticides, fungicides, and apparatus have been made, and the general results of these are shown in the Awards to Sundries. Many hundreds of enquiries regarding garden problems have been received and dealt with.

26. **School of Horticulture.**—The School of Horticulture has its full complement of students, and new admissions are made in April and October. Attention is particularly drawn to the Scholarships available in 1929.

27. **The Garden.**—Increase in the number of the Garden staff has led to the need to regrade the employees, and a new grade, that of sub-foreman, has been created, to be recruited from leading hands, the number of whom has also been increased. Progress has been made with the new undertakings outlined in the last report, and by the generosity of Mr. Mark Fenwick, who bore a part of the cost, the unity of alpine meadow and rock garden has been increased by the addition of several outcrops of large rocks. The work of placing them was done by Messrs. Pulham, assisted by the Garden staff.

The continued acquisition of new trees and shrubs, especially from China, has rendered necessary the extension of planting to the north of the new Rhododendron wood, and the opportunity is being taken to plant a large collection of Lilacs there.

28. **Standard Collections.**—Trials of garden plants have assumed a new aspect since the establishment of standard collections. Fellows now have an opportunity of seeing a large range of old and new varieties of each group every year growing side by side, so that comparisons may easily be made. Standard collections exist at Wisley now of Asters, Aubrietias, Cistuses, Crocuses, Dahlias, Delphiniums, Freesias, Fuchsias, Gladioli, Helianthemums, Bearded Irises, Lachenalias, Nerines, Pæonies, Phloxes, Roses, Veronicas, and Violas, and other such collections are in progress of formation. There are also the extensive standard collections of hardy fruits, including nuts, which are continually being added to, and which, with the fruit trials, are becoming annually more interesting. The Fruit and Vegetable trials are now at the north end of the Garden, and reports of trials concluded appear in the JOURNAL.

29. **Distribution of Plants.**—The annual distribution of plants and seeds in spring again shows an increase, and many newly introduced plants from the various expeditions participated in by the Society have been distributed. Fellows could materially assist this work by reading carefully the conditions which govern it, and reduce the heavy clerical work which it involves, by care in filling up the application form, many of which are annually received without name or address.

30. **Expeditions.**—The British Columbia collecting work had to be dropped for the present season owing to the ill-health of Mr. J. C. Bennett, who did such good work in 1927. Shares were taken in Mr. Clarence Elliott's expedition to Southern Chile, in Captain Kingdon Ward's expedition to Upper Burma and the marches of Tibet, and in Miss Hutchison's expedition to Greenland, and seeds are being raised from all three expeditions.

31. **Herbarium and Library.**—A good many specimens of plants of garden interest have been added to the Herbarium at Wisley, especially those collected during the British Columbia Expedition. A herbarium of varieties of hardy fruits is being prepared. This will be housed at Vincent Square. The library at Wisley has received many gifts of books and reports of researches, and some acquisitions by purchase.

32. **The Masters Lecture.**—The Masters Lecture (delivered annually by an eminent man of science upon recent scientific discoveries and their application to horticulture) was given on February 18 and March 13, by Professor F. V. Theobald, M.A., on "Some Recent Advances in the Control of Insect Pests." For the year 1929, Mr. R. G. Hatton, M.A., has been invited, and he will give lectures on October 2 and October 8 on "The Relationship between Scion and Root-stock with Special Reference to the Tree Fruits."

33. **The Society's Publications.**—*Curtis's Botanical Magazine* has been regularly published, and efforts are being taken to overcome the arrears. The Council regrets the death of Mr. Dring, of Messrs. Quaritch & Sons, Ltd., who took a very lively interest in the magazine.

The first volume of the *Index Londinensis* is in the hands of the printers. It is hoped that the subscribers will receive this volume in the first months of 1929. The Society has published during the year a List of Awards given to Orchids, 1925-26, and a List of Awards to Decorative Plants, Fruits and Vegetables, 1925-26. The publication of descriptions in pamphlet form, with cultural notes, of plants which have received the Award of Garden Merit is being taken in hand. The revision of some of the pamphlets which are so popular with the Fellows is being undertaken.

34. **The Lindley Library.**—During the year about 360 books and pamphlets have been added to the Library, and among the works which have been purchased the following may be mentioned:—Austen's "Treatise of Fruit Trees," Berghuis's "De Nederlandsche boomgaard," Brunfels' "In Dioscoridis historiam," Bussato's "Giardino di agricoltura," Camus' "Classification des saules d'Europe," "Connaissance et culture parfaite des belles fleurs," Dahuron's "Traité de la taille des arbres," Egenolph's "Plantarum arborum, fruticum et herbarum effigies," Finet and Gagnepain's "Contributions à la flore de l'Asie orientale," Groen's "Den Nederlandsen hovenier," Jacquin's "Monographie complète de melon," Knoche's "Flora Balearica," Moricand's "Plantes nouvelles d'Amérique," Penzig's "Pflanzen-Teratologie," "Pflanzbuchlin der Lustgaerten," Rozier's "Cours complet d'Agriculture," Tchibatcheff's "Asie Mineure, Botanique," Walcott's "North American wild flowers," Warner's "Dutch and Flemish flower and fruit painters of the 17th and 18th centuries."

35. **The Victoria Medal of Honour.**—The Victoria Medal of Honour has been awarded to Mr. A. Malcolm, the well-known amateur raiser of Sweet Peas, and Mr. W. Atkinson, the managing director of Messrs. Fisher, Son & Sibray's renowned Royal Nurseries, Handworth, Sheffield.

36. **The Lawrence Medal.**—The Lawrence Medal for the best exhibit staged at the Society's Shows during the year is awarded to the Hon. Vicary Gibbs for his exhibit of vegetables on October 9.

37. **The Veitch Memorial Medals.**—Awards have been made as follows:—Gold Medal and £50—To Miss Gertrude Jekyll, in commemoration of her services to horticulture and gardening.

Gold Medal—To Mr. C. G. A. Nix, for his services to the Society.

Silver Medal and £50.—To Mr. John Fraser, for his work on Pelargonium, Salix, and Mentha.

Silver Medal.—To Mr. Samuel Smith, The Gardens, Penjerrick, Falmouth, for his work in hybridizing Rhododendrons.

Silver Medal.—To Mr. W. Reynolds-Stephens, P.R.B.S., for his work in connexion with the Sculpture Section of the International Exhibition of Garden Design in October 1928.

Silver Medal and £25, and a Bronze Medal and £2 10s.—To the best Amateur exhibits, to be awarded at the Cornwall Spring Flower Show on April 23 and 24, 1929.

38. **The Cory Cup.**—The Cory Cup has been awarded to Mr. F. Stern for *Rosa highdownensis*, which was judged to be the best new hardy plant of garden origin shown to the Society in the course of the year.

39. **The Loder Rhododendron Cup.**—The Loder Rhododendron Cup has been awarded to Professor Wright Smith, M.A., F.L.S., V.M.H., of Edinburgh, in recognition of his very valuable work on Rhododendrons and Azaleas.

40. **The George Moore Medal.**—The George Moore Medal has been awarded to Mr. R. Paterson for his *Cypripedium* 'W. H. Moore,' 'Stonehurst variety,' which was considered the best *Cypripedium* shown to the Society in 1928.

41. **The Sander Medal.**—The Sander Medal for the best greenhouse novelty shown in 1928 was awarded for *Amaryllis* 'Baroness Schröder,' exhibited by Baron Schröder.

42. **The Williams Memorial Medals.**—The Williams Memorial Medals for the best groups of plants of one genus which show excellence in cultivation, exhibited during the year, have been awarded to:—Lady Aberconway and Hon. H. D. McLaren for their *Primulas* staged at Chelsea, and Messrs. Sutton & Sons for *Cyclamen* staged on February 28.

43. **International Horticultural Congress, 1930.**—The Council has invited the International Horticultural Congress to meet in London on August 7-15, 1930. The programme and preparations with regard to this Conference are being considered by a Committee. In honour of this Congress, the Society is arranging to make its Show on August 14 and 15, 1930, a special one. While there will be no accommodation for general exhibits from abroad, the Council has already intimated that exhibits of new plants will be welcomed. Fellows who are interested in the Conference are asked to inscribe their names as adherents with the Secretary, who will forward the particulars of the Congress in due course.

44. **Administration of the Society's Business.**—The Council has been considering means for providing further and better accommodation for the staff owing to the increase in the work and activities of the Society. The proposals will be laid before the Fellows at the Annual Meeting.

45. **Retiring Members of Council.**—The Council desires to record its appreciation of the services of the three retiring Members: Dr. A. W. Hill, Mr. G. Monro, and Mr. C. G. A. Nix. Dr. Hill, it is hoped, will take his place on the Council for another period of years, having recently been elected to the Council under the provisions of the new Bye-laws. It is difficult to appreciate sufficiently the keen interest, enthusiasm and generosity of Mr. Monro during his term of office, and the long service of many years, almost without interruption, of Mr. Nix, both on the Council and Finance Committee, has been of the greatest value in the conduct of the Society's affairs.

46. **The Press.**—The Council desires to thank the Press for the goodwill and the publicity which it gives so generously to the Society's activities.

47. **Committees and Judges.**—A great debt of gratitude is due to the members of all the Committees, and to all the Judges, who give up their time so freely to the affairs of the Society.

48. **Holford and Sewell Medals.**—The Council desires to acknowledge very gratefully the donation by the Executors of the late Sir George Holford of a gold medal to be awarded annually for the best amateur exhibit of plants and flowers (fruit and vegetables excepted) staged in the Halls of the Society at its fortnightly shows, and to Mr. A. J. Sewell for the donation of medals to be awarded annually

xiv PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

to amateurs and the trade for a display of plants suitable for the rock garden, and alpine house, at certain meetings of the Society.

49. **Further Acknowledgments.**—The Council desires to acknowledge gratefully the numerous gifts of seeds and plants from Fellows at home and abroad, and books for the Library from publishers and others; and thanks the Iris Society, which has presented to the Lindley Library the paintings of Mr. W. R. Dykes used to illustrate his 'Genus Iris.'

50. **The Staff.**—The Council wishes to take this opportunity to thank the members of the Society's staff, both at Vincent Square and at Wisley, for the loyal and diligent way in which their duties are being carried out.

Signed on behalf of the Council,
C. T. MUSGRAVE,
Vice-Chairman and Treasurer.

December 31, 1928.

SCHEDULE OF INVESTMENTS.

31st December, 1928.

			£	s.	d.
5 %	War Loan (1929-1947)	£8,981 10s. 0d.	cost 8,704	17	1
3½ %	Conversion Loan (1961)	£13,440 16s. 4d.	,, 9,618	6	4
3 %	Local Loans	£5,800	,, 6,006	16	6
2½ %	India Stock	£186 9s. 9d.	,, 109	2	2
3½ %	Dominion of Canada Registered Stock (1930-1950)	£2,000	,, 2,000	0	0
5 %	London County Stock (1940-1960)	£2,724 14s. 9d.	,, 2,295	16	0
2½ %	Metropolitan Consolidated Stock (1919-1949)	£4,462 10s. 10d.	,, 2,298	11	9
2½ %	Plymouth Corporation Stock (1918-1958)	£786 1s. 10d.	,, 386	19	7
6 %	Plymouth Corporation Red. Stock (1940-1950)	£551 9s. 0d.	,, 522	10	6
2½ %	Bristol Corporation Red. Debenture Stock (1957)	£2,704 5s. 6d.	,, 1,257	1	3
4½ %	Central Argentine Railway, Limited, Consolidated Preference Stock	£2,800	,, 2,907	3	6
4 %	Central Argentine Railway, Limited, Debenture Stock	£600	,, 537	15	10
5 %	Havana Terminal Railroad Company Mortgage Debenture Bonds	£8,300	,, 8,946	0	0
	Mortgage on Freehold	£250	,, 250	0	0
			<u>£45,841</u>	<u>0</u>	<u>6</u>

ON ACCOUNT OF GENERAL RESERVE FUND.

			£	s.	d.
5 %	War Loan (1929-1947)	£19,837 9s. 6d.	cost 19,951	7	9
3½ %	Conversion Loan (1961)	£6,606 17s. 5d.	,, 5,049	10	0
	London & North Eastern Railway 4 % Debs.	£5,510	,, 4,999	2	3
			<u>£30,000</u>	<u>0</u>	<u>0</u>

Dr.

ANNUAL REVENUE & EXPENDITURE ACCOUNT

To ESTABLISHMENT CHARGES—	£	s.	d.	£	s.	d.
Ground Rent	1,890	0	0			
Rates and Taxes	1,173	13	9			
Water Rate	119	6	6			
Electric Light	343	10	7			
Gas	115	15	4			
Salaries and Wages	5,583	6	4			
Annuities	52	0	0			
Printing and Stationery	1,466	5	8			
Publications	384	0	7			
Postages	1,002	13	9			
Fuel	92	2	0			
Professional Fees	867	12	6			
Gratuities	923	5	0			
Repairs and Renewals	339	3	1			
Miscellaneous Expenses	431	18	4			
				14,784	13	5
„ INSURANCES				135	4	5
„ JOURNAL, PRINTING AND POSTAGE				3,639	11	9
„ STAFF PENSIONS	727	2	4			
<i>Less contributed by Staff, as per scheme</i>	341	7	7			
				385	14	9
„ MEETINGS—						
Special Meetings	1,699	3	1			
Ordinary Meetings and Conferences	128	9	9			
Council, Committees and Deputation	674	1	11			
International Exhibition of Garden Design	2,630	6	1			
Painting Certificates	306	13	3			
				5,438	14	1
„ INSPECTION OF GARDENS				384	17	7
„ CUPS AND MEDALS—						
Awarded at Society's Meetings				390	12	6
„ CONTRIBUTION TO LINDLEY LIBRARY—						
Purchase of Books	331	15	10			
Contribution to Expenses, as per Trust A/c.	263	6	4			
				595	2	2
„ SPECIAL EXPENDITURE—						
Pritzel Revision Fund	843	19	7			
Opening Ceremony of New Hall	400	10	6			
Ghent Exhibition Contribution	150	0	0			
				1,394	10	1
„ DEPRECIATION—						
Hall Glass Roof, Furniture, and Appliances for Meetings, &c.				584	6	2
„ LOSS ON SALE OF INVESTMENTS				2,087	5	4
„ SCHOLARSHIPS—						
R.H.S. Working Scholarships	535	17	6			
<i>Less Contribution by Gardeners' Company</i>	150	0	0			
				385	17	6
„ EXAMINATIONS IN HORTICULTURE—						
Expenses	255	18	1			
<i>Less Fees</i>	188	14	0			
				67	4	1
„ RESTAURANT				814	7	2
„ BALANCE carried forward				22,686	12	3
				£53,774	13	3
„ WISLEY—						
Capital Expenditure	820	3	0			
Excess of Expenditure over Revenue	12,017	15	9			
				12,837	18	9
„ GENERAL RESERVE FUND				9,000	0	0
„ BALANCE, AS PER BALANCE SHEET				848	13	6
				£22,686	12	3

Cr.

[illegible]

Dr.

VINCENT SQUARE—BALANCE

LIABILITIES.

	£	s.	d.	£	s.	d.
To CAPITAL FUNDS ACCOUNT	51,524	2	2			
<i>Less</i> Fees paid by Fellows, now deceased	210	0	0			
	51,314	2	2			
„ LIFE COMPOSITIONS, 1928	564	18	0			
				51,879	0	2
„ SUNDRY CREDITORS				6,577	1	4
„ SUBSCRIPTIONS, paid in advance	797	19	0			
Do. Fritzal Index	1,202	13	2			
				2,050	12	2
„ GENERAL RESERVE FUND—						
Balance at 31st December, 1927	93,000	0	0			
<i>Added</i> 1928	9,000	0	0			
				102,000	0	0
(The Investments formerly representing this Fund have been partly utilized in the building of the New Hall.)						
„ SUPPLEMENTARY PENSION FUND				523	11	4
„ DEPRECIATION AND RENEWALS FUND—						
Balance at 31st December, 1927	5,623	10	2			
<i>Added</i> 1928	584	6	2			
				6,207	16	4
„ WEATHER INSURANCE FUND FOR CHELSEA AND OTHER MEETINGS				3,000	0	0
„ LABORATORY PRIZE FUND—						
Balance at 31st December, 1927	21	17	4			
Dividends (Nicholson Memorial Fund)	7	8	5			
	29	5	9			
<i>Less</i> expended 1928	12	6	6			
				16	19	3
„ WILLIAMS MEMORIAL FUND	9	13	6			
„ MASTERS MEMORIAL FUND	127	19	5			
„ SCHRÖDER PENSION FUND	6	6	8			
„ LINDLEY LIBRARY TRUST	10	0	0			
„ SIR JAMES KNOTT TRUST	142	10	0			
„ VEITCH MEMORIAL FUND	265	19	5			
„ MOORE MEDAL TRUST FUND	11	4	0			
				573	13	0
„ MRS. EDWARD HARDING CUP FUND				42	8	7
„ GENERAL REVENUE ACCOUNT brought forward from 1927	59,119	4	4			
„ REVENUE FOR THE YEAR 1928 as per Annexed Account	848	13	6			
				59,967	17	10
„ AMOUNTS TO BE INVESTED—						
Supplementary Pension Fund	109	9	11			
Depreciation and Renewals Fund	584	6	2			
Do. Do. Do. Wisley	250	0	0			
				943	16	1
				£233,732	16	1

ASSETS.

	£	s.	d.	£	s.	d.	£	s.	d.
By CAPITAL EXPENDITURE—									
„ HALL AND OFFICES—									
As at 31st December, 1927 . . . . .	.	.	.	41,277	13	4			
„ FURNISHING HALL AND OFFICES	3,318	1	5						
„ FURNISHING RESTAURANT	1,115	2	0						
				4,433	3	5			
„ NEW HALL AND EQUIPMENT	124,768	10	5						
„ RESTAURANT PLANT & EQUIPMENT	18,691	15	3						
				143,460	5	8			
							189,171	2	5
„ FREEHOLD PROPERTY, WISLEY—									
As at 31st December, 1927 . . . . .	.	.	.				13,158	13	9
„ SUPPLEMENTARY PENSION FUND INVESTMENT									
ACCOUNT				414	1	5			
Add Cash awaiting Investment				109	9	11			
							523	11	4
„ APPLIANCES FOR MEETINGS							366	14	3
„ SUNDRY DEBTORS AND PAYMENTS IN ADVANCE							2,768	1	0
„ WEATHER INSURANCE FUND, INVESTMENT ACCOUNT									
5% War Loan at 31st December, 1927									
£3,032 15s. 11d.							cost 3,000	0	0
„ BOTANICAL MAGAZINE—									
Stock				320	1	0			
Payments in advance				656	4	7			
							976	5	7
„ INVESTMENTS OF DEPRECIATION AND RENEWALS									
FUND				5,623	10	2			
Add Cash awaiting Investment				584	6	2			
							6,207	16	4
„ WORKING WATER COMPANY—									
Deposit in respect of laying water mains from									
Ripley to Wisley Gardens							1,260	0	0
„ HERBARIUM							88	17	0
„ INVESTMENTS—									
3½% Conversion Loan (1961) £13,424 1s. 4d.							cost 9,618	6	4
„ GENERAL RESERVE FUND—									
Investments (3½% Conversion Loan (1961))									
£6,606 17s. 5d.							cost 5,049	10	0
„ CASH ON DEPOSIT—									
Pritzel Subscriptions in Advance							1,202	13	2
„ CASH AT BANK							341	4	11

£233,732 16 1

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on the 31st December, 1928. In the total of Assets, £233,732 16s. 1d., are included investments and Cash amounting to a total sum of £6,207 16s. 4d., representing depreciation reserves on account of such matters as roof renewal, hall painting, &c., and these funds are not available for the General Purposes of the Society.

ALFRED C. HARPER, F.C.A., *Auditor*

(HARPER BROTHERS & FEATHER, *Chartered Accountants*).

35 Great Tower Street, London, E.C. 3.

15th January, 1929.

Dr. WISLEY GARDENS—ANNUAL REVENUE & EXPENDITURE

	£	s.	d.	£	s.	d.
To SALARIES—						
Wisley Gardens and Research Station				4,805	12	0
„ RATES AND TAXES	209	7	2			
„ WATER RATE	69	4	2			
„ INSURANCES	162	1	6			
„ LABOUR	5,177	18	3			
„ GARDEN IMPLEMENTS	53	18	7			
„ LOAM AND MANURE	460	6	7			
„ REPAIRS.	684	10	10			
„ FUEL	428	0	10			
„ PROFESSIONAL FEES	9	3	0			
				7,254	10	11
„ SPECIAL EXPENDITURE—						
Special Laboratory Apparatus				629	0	0
„ MISCELLANEOUS EXPENSES—						
Garden and Farm	1,319	17	8			
Laboratory	80	19	10			
Trees and Shrubs	153	7	8			
				1,554	5	2
„ STAFF PENSIONS	606	9	7			
Less contributed by staff, as per scheme	314	14	7			
				291	15	0
„ DEPRECIATION—						
Glass Houses, Plant, and Materials	625	12	6			
Motors	90	0	0			
				715	12	6
				£15,250	15	7

ACCOUNT FOR YEAR ENDED 31st DECEMBER, 1928.

Cr.

	£	s.	d.
By DIVIDENDS AND INTEREST	1,373	15	5
„ PRODUCE SOLD	868	5	0
„ ANALYSIS FEES	25	18	6
„ STUDENTS' FEES	84	0	0
„ CONTRIBUTION BY MINISTRY OF AGRICULTURE—			
On account of Fruit Testing Station	881	0	11
„ BALANCE, being excess of Expenditure over Income, carried to			
Revenue and Expenditure Account, Vincent Square	12,017	15	9

£15,250 15 7

WISLEY GARDENS—BALANCE

£	s.	d.	£	s.	d.
---	----	----	---	----	----

As at 31st December, 1927	36,044	17	6
Add Payments by R.H.S., 31st December, 1928	820	3	0
	<u> </u>		36,865 0 6

,, DEPRECIATION AND RENEWALS RESERVE FUND—			
As at 31st December, 1927	5,361	19	3
Added to Fund, 1928	250	0	0
	<u>5,611</u>	<u>19</u>	<u>3</u>

£65,819 7 8

ASSETS.									
	£	s.	d.	£	s.	d.	£	s.	d.
By DWELLING HOUSES—									
As at 31st December, 1927				5,651	17	4			
„ GLASS HOUSES, RANGES, POTTING SHEDS—									
As at 31st December, 1927	6,390	0	4						
Additions during 1928	660	0	0						
				7,050	0	4			
„ LABORATORY—									
As at 31st December, 1927				20,669	13	2			
							33,371	10	10
N.B.—The Hanbury Trust Estate is under the Trust Deed, vested in the Society only so long as it is in the position to use it as an Experimental Garden. Accordingly the Expenditure thereon by the Society is an Asset only so long as the Gardens continue to be used by the Society.									
„ STOCK FUEL							100	0	0
„ MOTOR CARS AND LORRY				184	11	6			
Less Depreciation				90	0	0			
							94	11	6
„ VALUATION OF PLANT AND LOOSE EFFECTS (as valued by the Director)—									
Gardens and Laboratory				2,062	0	0			
Farm				1,223	15	3			
							3,285	15	3
„ LIBRARY							391	15	7
„ INVESTMENT OF DEPRECIATION AND RENEWALS RESERVE ACCOUNT—									
5% War Loan, 1929-47	£2,738/10/5	cost		2,637	5	11			
3½% Conversion Loan, 1961	£1,041/6/2	„		736	12	0			
5% London Cnty. Stk., 1940-60	£785/5/3	„		661	13	6			
2½% Met. Cons. Stk., 1919-49	£1,287/9/2	„		662	19	3			
2½% Plymouth Cor. Stock, 1918-58	£288/8/10	„		142	1	0			
6% Plymouth Cor. Rd. Stk., 1940-50	£159/18/4	„		151	12	4			
2½% Bristol Cor. Red. Deb. Stock, 1957	£795/14/6	„		369	15	3			
Add Cash for Investment				250	0	0			
							5,611	19	3
„ ENDOWMENT TRUST FUND INVESTMENTS—									
5% War Loan, 1929-47	£9,350	cost		8,972	7	11			
3½% Conversion Loan, 1961	£2,484/4/1	„		2,000	0	0			
5% London Cnty. Stk., 1940-60	£600	„		505	12	0			
3½% London County Con. Stock	£135/8/4	„		130	0	0			
2½% Met. Con. Stk., 1919-49	£970	„		499	12	0			
6% Ply. Cor. Rd. Stk., 1940-50	£30/9/4	„		29	6	4			
2½% Plymouth Cor. Stk., 1918-58	£400	„		197	1	0			
2½% Bristol Cor. Red. Deb. Stk., 1957	£600	„		278	18	6			
London & N.E. Rly. 4% Deb. Stk.	£3,500	„		3,535	0	0			
Can. Pac. Rly. 4% Per. Cons. Deb. Stock	£4,632	„		3,890	17	6			
Buenos Ayres Gt. S. Rly. 5% Non-Cum. Pref. Stock	£2,500	„		2,825	0	0			
City of Moscow Loan 1912, 4½% Bonds	£6,000	val. e		100	0	0			
							22,963	15	3
(No interest was received during the year on City of Moscow Loan)									
							£65,819	7	8

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position on the 31st December, 1928.

ALFRED C. HARPER, F.C.A., Auditor

(HARPER BROTHERS & FEATHER, Chartered Accountants),

35 Great Tower Street, London, E.C.3.

15th January, 1929.

Dr. **RESTAURANT—PROFIT AND LOSS ACCOUNT FROM**

	£	s.	d.
To PURCHASES	558	7	2
„ WAGES	422	0	9
„ RATES	137	0	6
„ LICENCE	278	3	9
„ FUEL	17	17	0
„ GAS	17	7	11
„ ELECTRIC LIGHT AND POWER	35	14	6
„ WATER RATE	1	12	0
„ INSURANCE	2	0	0
„ COMMISSION ON SALES	127	14	3
„ TRANSPORT ON GOODS	9	10	1
„ TRAVELLING	1	16	10
„ STAFF FOOD	82	12	5
„ SUNDRIES	224	12	3
„ HIRE OF PLANT	175	0	0
	<u>£2,091</u>	<u>9</u>	<u>5</u>

Dr. **BOTANICAL MAGAZINE—PROFIT AND LOSS ACCOUNT**

	£	s.	d.
To STOCK, 1ST JANUARY, 1928	100	0	0
„ PRINTING AND BINDING	254	4	6
„ PLATES	471	3	3
„ EDITOR	94	0	0
„ SALARIES	196	16	0
„ COMMISSION	23	10	11
„ MISCELLANEOUS	43	6	0
„ DISTRIBUTION EXPENSES	10	19	0
„ REVENUE AND EXPENDITURE ACCOUNT	174	19	5
	<u>£1,368</u>	<u>19</u>	<u>1</u>

17th OCTOBER, 1928, TO 30th NOVEMBER, 1928.

Cr.

	£	s.	d.
By TAKINGS AT RESTAURANT	1,277	2	3
„ REVENUE AND EXPENDITURE ACCOUNT	814	7	2

£2,091 9 5

FOR THE YEAR ENDED 31st DECEMBER, 1928.

Cr.

	£	s.	d.
By SALES	1,042	1	7
„ ADVERTISEMENTS		6	16 6
„ STOCK, 31ST DECEMBER, 1928	320	1	0

£1,368 19 1

Dr.

ALFRED DAVIS

Bequeathed to the Society in 1870 for Annual Prizes

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1927	946	0	3			

	£	s.	d.	£	s.	d.
„ Dividends received 1928	946	0	3			
				51	8	10

WILLIAMS

Raised by Donations in 1891 in Memory of

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1927	204	2	5			
„ Added 1928	41	9	4			

	£	s.	d.	£	s.	d.
„ Balance 31st December, 1927	245	11	9	107	12	4
„ Dividends received 1928				9	13	6
				117	5	10

MASTERS

Raised by Donations in 1908 in Memory of Dr. Masters

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1927	542	17	0			

	£	s.	d.	£	s.	d.
„ Balance 31st December, 1927	542	17	0	127	19	5
„ Dividends received 1928				20	0	0
				147	19	5

NICHOLSON

Raised by Donations in 1908 in Memory of

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1927	180	14	4			

	£	s.	d.	£	s.	d.
„ Dividends received 1928	180	14	4	7	8	5
				7	8	5

SCHRÖDER

Provided by Royal Horticultural Society in Memory of the late Baron

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1927	557	14	6			
„ Balance 31st December, 1927				6	6	8
„ Dividends received 1928				20	0	0
				26	6	8

TRUST FUND.

Cr.

or in any other way the Council may determine.

	£	s.	d.	£	s.	d.
By London County 5% Stock, 1940-60, £375	316	0	0			
„ Met. Consd. 2½% do. 1919-40, £610	314	4	0			
„ Plymouth Corpn. 2½% do. 1918-58, £200	98	10	6			
„ Do. 6% Red. 1940-50, £32 7 0	31	2	3			
„ Bristol Corpn. 2½% Deb. Stk., 1957, £400	186	3	6			
	<u>946</u>	<u>0</u>	<u>3</u>			
„ Revenue and Expenditure Account				51	8	10

MEMORIAL FUND.

B. S. Williams towards Prizes and Medals.

	£	s.	d.	£	s.	d.
By East India Railway Co. Annuity, Class B £7	168	0	0			
„ 3½% Conversion Loan, £55 1s. 9d.	41	9	4			
„ New South Wales 4% Inscribed Stock 1942-62, £36 3s. 1d.	36	2	5			
	<u>245</u>	<u>11</u>	<u>9</u>			
„ Medal				66	3	0
„ Purchase of 3½% Conversion Loan				41	9	4
„ Balance in hands of R.H. Society				9	13	6
				<u>117</u>	<u>5</u>	<u>10</u>

MEMORIAL FUND.

towards the Provision of one or more Annual Lectures.

	£	s.	d.	£	s.	d.
By London Midland & Scottish 4% Preference Stock, £250	290	13	6			
„ London Midland & Scottish 4% Guaranteed Stock	252	3	6			
	<u>542</u>	<u>17</u>	<u>0</u>			
„ Lectures given				20	0	0
„ Balance in hands of R.H. Society				127	19	5
				<u>147</u>	<u>19</u>	<u>5</u>

MEMORIAL FUND.

George Nicholson for Prizes.

	£	s.	d.	£	s.	d.
By Local Loans, 3%, £31 11s. 0d.	20	1	5			
„ Tasmanian Government 4% Inscribed Stock, 1940-50, £162 4s. 5d.	160	12	11			
	<u>180</u>	<u>14</u>	<u>4</u>			
„ Wisley Laboratory Prize Fund				7	8	5
				<u>7</u>	<u>8</u>	<u>5</u>

PENSION.

Schröder to pay to Gardeners' Royal Benevolent Institution for one Pension.

	£	s.	d.	£	s.	d.
By Great Western Railway 4% Debenture Stock, £500	557	14	6			
„ Gardeners' Royal Benevolent Institution				20	0	0
„ Balance in hands of R.H. Society				6	6	8
				<u>26</u>	<u>6</u>	<u>8</u>

Dr.

LINDLEY LIBRARY

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1927	9,450	5	5			
„ Contribution from R.H. Society, 31st December, 1928	331	15	10			
	<u>9,782</u>	<u>1</u>	<u>3</u>			
To Balance 31st December, 1927				10	0	0
„ Dividends				45	9	6
„ Contribution from R.H. Society, 31st December, 1927				263	6	4
„ Indemnity for lost book				7	6	
				<u>319</u>	<u>3</u>	<u>4</u>

PRITZEL REVISION

Fund to be raised for the Revision of

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1927	859	2	2			
„ Contribution by R.H. Society				843	19	7
„ Dividends received 1928				34	3	10
				<u>878</u>	<u>3</u>	<u>5</u>

SIR JAMES KNOTT

Bequeathed to the Society in 1920 for the purpose

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1927	600	0	0			
„ Balance 31st December, 1927				135	0	0
„ Dividends received 1928				30	0	0
				<u>165</u>	<u>0</u>	<u>0</u>

VEITCH MEMORIAL

For the Encouragement

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1927	1,673	19	1			
„ Balance 31st December, 1927				293	15	0
„ Dividends and Interest received 1928				83	13	11
				<u>377</u>	<u>8</u>	<u>11</u>

MOORE MEDAL

Presented to the Society in 1926 to provide a medal annually for the best

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1927	190	10	6			
„ Balance 31st December, 1927				9	6	9
„ Dividend received 1928				9	6	9
				<u>18</u>	<u>13</u>	<u>6</u>

SEWELL MEDAL

Presented to the Society in 1928 to provide

	£	s.	d.
To Amount of Fund	100	0	0

TRUST.

Cr.

	£	s.	d.	£	s.	d.
By London Midland & Scottish Railway 4% Preference						
Stock, £1,137	1,458	15	7			
„ Value of Library, 31st December, 1927	7,991	9	10			
„ Purchase of Books, 1928	331	15	10			
	<u>9,782</u>	<u>1</u>	<u>3</u>			
By Librarian's Salary				300	0	0
„ Insurance				9	3	4
„ Balance in hands of R.H. Society				10	0	0
				<u>319</u>	<u>3</u>	<u>4</u>

FUND.

Pritzels Iconum Botanicarum Index.

	£	s.	d.	£	s.	d.
By India 2½% Stock, £1,367 13s. 6d.	859	2	2			
„ Exp. of Revision				878	3	5
				<u>878</u>	<u>3</u>	<u>5</u>

TRUST.

of providing a Scholarship for Wisley Students.

	£	s.	d.	£	s.	d.
By War Loan 5%, 1929-47	600	0	0			
„ Cash expended				22	10	0
„ Balance in hands of R.H. Society				142	10	0
				<u>165</u>	<u>0</u>	<u>0</u>

TRUST FUND.

of Horticulture.

	£	s.	d.	£	s.	d.
By Victorian Government 5% Inscribed Stock	1,354	0	1			
„ War Loan 5%, 1929-47	319	19	0			
	<u>1,673</u>	<u>19</u>	<u>1</u>			
„ Amount distributed				111	9	6
„ Balance in hands of R.H. Society				265	19	5
				<u>377</u>	<u>8</u>	<u>11</u>

TRUST FUND.

new Cypridium shown to the R.H. Society during the year.

	£	s.	d.	£	s.	d.
By War Loan 5%, 1929-47	186	15s. 0d.	cost	190	10	6
„ Medal				7	9	6
„ Balance in hands of R.H. Society				11	4	0
				<u>18</u>	<u>13</u>	<u>6</u>

TRUST FUND.

6 Medals annually for Rock-Garden Plants.

	£	s.	d.
By 4% Consolidated Stock	114	3s. 6d.	cost
	<u>100</u>	<u>0</u>	<u>0</u>

XXX PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

MARCH 12, 1929.

Mr. W. B. CRANFIELD in the Chair.

A lecture was given by Sir Daniel Hall, K.C.B., M.A., F.R.S., on " Breaking and Other Sports of the Garden Tulip."

MARCH 26, 1929.

Lt.-Col. Sir DAVID PRAIN, C.M.G., C.I.E., LL.D., F.R.S., F.L.S., V.M.H.,
in the Chair.

A lecture was given by Prof. Wm. Wright Smith, M.A., V.M.H., on " The Distribution of the Genus *Primula* " (see vol. 54, p. 4).

DAFFODIL SHOW.

APRIL 16-17, 1929.

CHIEF AWARDS IN THE COMPETITIVE CLASSES.

The Engleheart Challenge Cup and a Silver-gilt Lindley Medal, for twelve varieties of Daffodils raised by the exhibitor.

To Mr. G. L. Wilson, The Knockan, Broughshane, Co. Antrim.

Silver-gilt Lindley Medal, for twelve varieties of Daffodils not in commerce.

To Mr. J. L. Richardson, Prospect Gardens, Waterford, Ireland.

DEPUTATION TO TRURO.

APRIL 23, 1929.

A deputation consisting of Mr. R. Cory, F.L.S., Mr. Mark Fenwick, J.P., and Dr. A. W. Hill, C.M.G., F.R.S., visited the Cornwall Spring Flower Show Society's show at Truro and made the following awards :—

Gold Medal.

To Mr. J. C. Williams, Caerhays, for a group of Rhododendrons.

Silver Flora Medal.

To Messrs. R. Veitch & Son, Exeter, for hardy shrubs.

Silver Banksian Medal.

To Mr. R. Barclay Fox, Penjerrick, Falmouth, for twelve Rhododendron species.

To Mr. P. D. Williams, Lanarth, for twelve Rhododendron hybrids.

To Miss Wingfield, Pendrae, Penzance, for six shrubs.

To Miss L. Williams, Lanarth, for hardy herbaceous plants.

To The Devon Rosery Co., Torquay, for shrubs.

Lindley Medal.

To Mrs. Henderson Ball, Falmouth, for seedling Anemone 'Mary Seton.'

To Miss L. Williams, Lanarth, for double purple Polyanthus.

Silver Veitch Memorial Medal and £5.

To Rev. A. T. Boscawen, Ludgvan, for twelve shrubs.

Bronze Veitch Memorial Medal and £2 10s.

To Miss Wingfield, Pendrae, Penzance, for Kurume Azaleas.

MAY 7, 1929.

Mr. F. J. HANBURY, F.L.S., V.M.H., in the Chair.

A lecture was given by Sir Frederick W. Moore, M.A., V.M.H., on " Plants for Walls " (p. 53).

CHELSEA SHOW.

MAY 22-24, 1929.

Held in the Royal Hospital Gardens, Chelsea.

The following accepted the Council's invitation to assist in judging the exhibits :—

BAKER, G. P.	JOHNSTONE, G. H.
BAKER, HIATT C.	LAWRENCE, Sir WILLIAM, Bt.
BAKER, W. G.	MCLEOD, J. F.
BALFOUR, F. R. S., M.A., D.L., J.P., V.M.H.	MAWSON, E. P., F.R.I.B.A.
BARNES, N. F., V.M.H.	MAY, H. B., V.M.H.
BEAN, W. J., I.S.O., V.M.H.	METCALFE, A. W.
BECKETT, E., V.M.H.	MEYER, Rev. ROLLO.
BEDFORD, A.	MONRO, G., C.B.E.
BENNETT, W.	NEDDHAM, C. W.
BILNEY, W. A., J.P., V.M.H.	NIX, C. G. A., V.M.H.
BLISS, D.	PAGE, COURTENAY.
BRIDGEFORD, J. M.	PEARSON, C. E., F.L.S., V.M.H.
BRUNTON, J. S.	PERKINS, H.
CHURCHER, Maj. G.	PETTIGREW, W. W., V.M.H.
COOK, T. H.	PILKINGTON, G. L.
COUTTS, J.	PRESTON, F. G.
CURTIS, C. H., F.L.S.	PUDDLE, F. C.
FENWICK, G.	RIDING, J. B.
FIFE, R.	ROGERS, F. J.
GIBBS, Hon. VICARY, V.M.H.	ROTHSCHILD, LIONEL DE, O.B.E.
GIBSON, J.	SHILL, J. E.
HARRIS, J. M.	STERN, F. C.
HOLLAND, Sir EDWARD.	UNWIN, W. J.
IRVING, W.	WHITE, A. W.
JAMES, Hon. ROBERT.	WHITE, E., V.M.H.

LIST OF AWARDS.

Sherwood Cup, for the most meritorious exhibit in the Show.

To Messrs. Sutton & Sons, Reading, for greenhouse plants.

Cain Cup, for the best exhibit shown by an Amateur.

To Lady Aberconway and the Hon. H. D. McLaren, Bodnant, Wales, for a mixed group of less common plants.

Gold Medal.

To Messrs. Clarence Elliott, Ltd., Stevenage, for rock garden.

To Mr. Gavin Jones, Letchworth, for rock garden.

To Mr. G. G. Whitelegg, Chislehurst, for rock garden.

To Messrs. R. Bolton & Son, Birdbrook, for Sweet Peas.

To Messrs. G. Bunyard & Co., Ltd., Maidstone, for Irises.

To Messrs. Barr & Sons, Covent Garden, for Tulips.

To The Hon. Vicary Gibbs, Aldenham, Elstree, for vegetables.

To Messrs. H. G. Alexander, Ltd., Tetbury, for Orchids.

To Messrs. Charlesworth & Co., Ltd., Haywards Heath, for Orchids.

To Messrs. J. & A. McBean, Cooksbridge, for Orchids.

To Messrs. J. Carter & Co., Raynes Park, for Sweet Peas and other florists' flowers.

To Messrs. R. Wallace, Tunbridge Wells, for mixed group of Lilies, Irises, Rhododendrons, and hardy plants.

To Lady Aberconway and the Hon. H. D. McLaren, Bodnant, Wales, for mixed group of less common plants.

To Messrs. C. Engelmann, Ltd., Saffron Walden, for Carnations.

To Messrs. Allwood, Haywards Heath, for Carnations and Pinks.

To Messrs. R. Wallace, Tunbridge Wells, for a garden.

xxxii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

To Messrs. Sutton & Sons, Reading, for greenhouse plants.
 To Messrs. R. & G. Cuthbert, Ltd., Southgate, for Azaleas and other shrubs.
 To Messrs. Hillier & Sons, Winchester, for Cherries, Crabs, and shrubs.
 To Messrs. G. Jackman & Son, Woking, for Clematis.
 To Mr. R. C. Notcutt, Woodbridge, for Lilacs, Brooms, and other shrubs.
 To Mrs. A. Sherman Hoyt, California, U.S.A., for an exhibit of Californian desert plants and a Californian redwood forest scene.

Silver Cup.

To Messrs. Dobbie & Co., Ltd., Edinburgh, for Sweet Peas.
 To Messrs. Hodsons, Ltd., Nottingham, for rock garden.
 To Sir Jeremiah Colman, Bt., Gatton Park, Reigate, for Orchids.
 To Messrs. Sanders, St. Albans, for Orchids.
 To Messrs. Cheal & Sons, Ltd., Crawley, for a garden.
 To Messrs. W. H. Gaze & Sons, Ltd., Kingston, for a garden.
 To Messrs. Frank Cant & Co., Ltd., Colchester, for Roses.
 To Messrs. Chaplin Bros., Ltd., Waltham Cross, for Roses.
 To Messrs. L. R. Russell, Ltd., Richmond, for stove and greenhouse plants.
 To Messrs. Blackmore & Langdon, Bath, for Begonias.
 To Mr. James Douglas, Gt. Bookham, for Auriculas.
 To Messrs. Blackmore & Langdon, Bath, for Delphiniums.
 To Messrs. A. Charlton & Sons, Rotherfield, for trees and shrubs.
 To The Donard Nursery Co., Newcastle, Co. Down, for shrubs and Conifers.
 To Mr. G. Reuthe, Keston, for shrubs.

Silver-gilt Flora Medal.

To Messrs. Pulham & Son, Newman Street, London, for rock garden.
 To Messrs. Tucker, Ltd., Headington, for rock garden.
 To Messrs. R. & G. Cuthbert, Southgate, for Azaleas.
 To Mr. W. C. Slocock, Woking, for Rhododendrons.
 To Messrs. John Waterer, Sons & Crisp, Ltd., Bagshot, for Rhododendrons.
 To Messrs. Black & Flory, Slough, for Orchids.
 To Messrs. Cowan & Co., Southgate, for Orchids.
 To Messrs. Stuart Low & Co., Enfield, for Orchids.
 To Messrs. Casburn & Welch, Cambridge, for plants and dwarf shrubs for the rock garden.

To Messrs. A. & W. Perry, Enfield, for mixed group of herbaceous plants, Irises and Lilies, etc.

To Messrs. Ben. R. Cant & Sons, Ltd., Colchester, for Roses.
 To Messrs. Alex. Dickson & Sons, Ltd., Belfast, for Roses.
 To The En-Tout-Cas Co., Ltd., Leicester, for a garden.
 To Messrs. M. Prichard & Sons, Christchurch, for herbaceous plants.
 To Messrs. John Waterer, Sons & Crisp, Ltd., Twyford, for herbaceous plants.
 To Messrs. W. Fromow & Sons, Chiswick, for Japanese Maples.
 To Messrs. L. R. Russell, Ltd., Richmond, for trees, shrubs, and climbers.
 To Messrs. W. Watson & Sons, Ltd., Dublin, for Brooms.
 To The Yokohama Nursery Co., Kingsway, for Japanese dwarf trees and Kurume Azaleas.

Silver-gilt Banksian Medal.

To Mr. H. F. Fletcher, St. Asaph, for Tulips.
 To Mr. G. G. Whitelegg, Chislehurst, for Azaleas.
 To Messrs. R. Gill & Son, Falmouth, for Rhododendrons and shrubs.
 To Messrs. Alex. Dickson & Sons, Ltd., Belfast, for Sweet Peas.
 To Messrs. Armstrong & Brown, Tunbridge Wells, for Orchids.
 To J. J. Joicey, Esq., Witley, Surrey, for Orchids (gr. Mr. J. Mackay). [*This exhibit also won the Cup offered for award for the best exhibit of Orchids shown by an amateur in a space not exceeding 60 sq. ft.*]
 To Col. W. Kemmis, Lymington, for Primulas (gr. Mr. J. W. Chapman).
 To Mr. Gavin Jones, Letchworth, for rock-garden plants.
 To Mr. W. Wells, Jun., Mersham, for rock-garden plants.
 To Messrs. Bees, Ltd., Chester, for shrubs, herbaceous and rock-garden plants.
 To Messrs. B. Ladhams, Ltd., Southampton, for alpine and herbaceous plants.
 To Mr. G. Reuthe, Keston, for rock-garden plants.
 To Messrs. Lowe & Gibson, Crawley Down, for group of Border Carnations.
 To Messrs. W. Cutbush & Son, Ltd., Barnet, for a garden.
 To Mr. Ernest Dixon, Putney, for a garden.
 To Messrs. W. Wood & Son, Ltd., Taplow, for a garden.

To Messrs. Elisha J. Hicks, Twyford, for Roses.
 To Messrs. E. Webb & Sons, Ltd., Stourbridge, for mixed group of Cinerarias, Schizanthus, Primulas, and annuals.
 To Messrs. Dobbie & Co., Ltd., Edinburgh, for Calceolarias.
 To Messrs. H. J. Jones, Lewisham, for Hydrangeas.
 To Messrs. A. & W. Perry, Enfield, for Ferns.
 To Mr. G. H. Dalrymple, Bartley, for Lupins.
 To Messrs. Hewitt & Co., Ltd., Solihull, for Delphiniums.
 To Messrs. Bakers, Ltd., Codsall, for Delphiniums, Trollius, and other herbaceous plants.
 To Messrs. M. Prichard & Sons, Christchurch, for herbaceous plants.
 To Messrs. G. Bunyard & Co., Ltd., Maidstone, for Pæonies.
 To Messrs. M. Prichard & Sons, Christchurch, for rock-garden plants.
 To Messrs. J. Cheal & Sons, Ltd., Crawley, for trees and shrubs.
 To Messrs. W. Cutbush & Son, Ltd., Barnet, for clipped trees and Hydrangeas.
 To Messrs. Fletcher Bros., Ltd., Chertsey, for hardy trees, shrubs, and Conifers.
 To W. J. Marchant, Borough Green, for trees and shrubs.
 To Messrs. R. Veitch & Son, Exeter, for shrubs.
 To Messrs. John Waterer, Sons & Crisp, Ltd., Twyford, for trees and shrubs.

Silver Flora Medal.

To Mr. W. E. T. Ingwerson, Sharpthorne, for a rock garden.
 To Mr. F. Street, West Chobham, for Rhododendrons.
 To The Orpington Nursery Co., Ltd., Orpington, for Irises.
 To Messrs. Mansell & Hatcher, Rawdon, for Orchids.
 To Messrs. Clarence Elliott, Ltd., Stevenage, for rock-garden plants.
 To C. Kirch, Esq., Beckenham, for alpine plants.
 To Messrs. W. H. Rogers & Son, Ltd., Southampton, for rock-garden plants and dwarf shrubs.
 To Messrs. John Waterer, Sons & Crisp, Ltd., Twyford, for rock-garden plants and dwarf shrubs.
 To Messrs. W. Cutbush & Son, Ltd., Barnet, for Roses.
 To Messrs. W. Easlea & Sons, Leigh-on-Sea, for Roses.
 To Mr. W. Yandell, Maidenhead, for Violas.
 To Messrs. Bakers, Ltd., Codsall, for Astilbes.
 To Messrs. Carter Page & Co., Ltd., London Wall, for Dahlias.
 To Messrs. Wilson & Agar, Reading, for hardy perennials.
 To Mr. T. Robinson, Nottingham, for Dahlias and Ageratum.
 To Messrs. R. Green, Ltd., London, for Bay trees.
 To Messrs. Harrods, Ltd., London, for clipped Box and Bay trees.
 To Mr. John Klinkert, Richmond, for topiary.

Silver Banksian Medal.

To the Rev. H. Rollo Meyer, Watton Rectory, Hertford, for Tulips.
 To Mr. W. C. Slocock, Woking, for Rhododendrons.
 To Mr. J. Stevenson, Wimborne, for Sweet Peas.
 To Mr. G. H. Dalrymple, Bartley, for Primulas.
 To Messrs. Bakers, Ltd., Codsall, for rock-garden plants.
 To Messrs. Clarence Elliott, Ltd., Stevenage, for trough gardens.
 To Messrs. H. Langridge & Co., Westerham, for rock-garden plants.
 To Messrs. Maxwell & Beale, Broadstone, for Primulas and rock-garden plants.
 To Messrs. W. Wood & Son, Ltd., Taplow, for rock-garden plants.
 To Messrs. Barr & Sons, Covent Garden, for mixed group of Irises, herbaceous and rock garden plants.
 To Messrs. John Peed & Son, West Norwood, for stove and greenhouse plants.
 To H. P. Russell, Esq., Bexley Heath, for Calceolarias.
 To Mr. H. Clarke, Taunton, for Violas.
 To Messrs. Hewitt & Co., Ltd., Solihull, for shrubs.
 To Messrs. Hollamby, Groombridge, for trees and shrubs.

Flora Medal.

To Mr. Ernest Dixon, Putney, for rock garden.
 To Messrs. H. & W. Evans, Cardiff, for rock garden.
 To The Orpington Nurseries Co., Ltd., Orpington, for rock garden.
 To Messrs. R. H. Bath, Ltd., Wisbech, for Tulips.
 To E. R. Ashton, Esq., Tunbridge Wells, for Orchids (gr. Mr. O. V. Kent).

xxxiv PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

To Mr. S. J. Goodliffe, Bishop's Stortford, for group of shrubs, herbaceous and rock garden plants.

To Messrs. Stuart Low & Co., Enfield, for Carnations.

To Garden Services, Carshalton, for a garden.

To Messrs. Stuart Low & Co., Enfield, for Hippeastrums, Australian shrubs, and other greenhouse plants.

To Studley College, Warwickshire, for *Campanula Medium calycanthema*.

To Messrs. E. F. Fairbairn & Sons, Carlisle, for Dahlias.

To Messrs. Kelway & Sons, Langport, for hardy plants.

To Mr. Charles Turner, Slough, for shrubs.

Banksian Medal.

To Mr. T. M. Endean, Laindon, for Cacti.

To Mr. H. Dixon, Wandsworth, for Orchids.

To Messrs. Daniels Bros., Ltd., Norwich, for group of Aquilegias, Irises, Anemones, and Tulips.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Mr. C. H. Herbert, Birmingham, for Pinks.

To Messrs. James MacDonald, Harpenden, for grasses.

To Messrs. Reamsbottom & Co., West Drayton, for Anemones.

To Messrs. W. Wood & Son, Ltd., Taplow, for herbaceous plants.

To Messrs. D. Stewart & Son, Wimborne, for trees and shrubs.

To Marsden Hardy Plant Nurseries, Ashted, for shrubs.

Silver-gilt Hogg Medal.

To Messrs. Laxton Bros., Bedford, for Strawberries.

Silver Hogg Medal.

To Messrs. G. Bunyard & Co., Ltd., Maidstone, for Apples.

To Messrs. T. Rivers & Son, Ltd., Sawbridgeworth, for fruit trees in pots.

Silver Knightian Medal.

To Messrs. S. Bide & Sons, Farnham, for Tomatos.

JUNE 11, 1929.

Lt.-Col. L. C. R. MESSEL, O.B.E., in the Chair.

A lecture was given by Mr. J. Comber on "The Cultivation of the Newer Chinese and Andean Plants."

HARDING PÆONY CUP COMPETITION.

JUNE 25, 1929.

The Pæony Cup, presented by Mrs. Edward Harding, was awarded to Mr. W. B. Cranfield.

Mr. JOSEPH CHEAL, V.M.H., in the Chair.

A lecture was given by Dr. A. H. Williams on "New Zealand Plants: with some theories as to difficulties in their cultivation" (p. 101).

SCIENTIFIC COMMITTEE.

JANUARY 15, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and ten other members present.

Transfusion of Sap.—Mr. Hooper sought information on this subject, and referred to work done at Chard, Sutton, in a plantation of 'Doyenné du Comice' pears which were unfruitful although interplanted with, and cross-pollinated from, 'Conference' and 'Fertility.' A proportion of the 'Doyenné du Comice' were then crown-grafted with 'Glou Morceau' which had proved a good pollenizer in another district, and the result was that the grafted trees produced heavy crops of fruits below the grafts, while the ungrafted trees were almost fruitless.

Mr. Worsley remarked that in the Thames Valley it was the practice to cut out the centre of pear trees to give more light and air to the other branches, which then became more fruitful. It was suggested that Mr. Hooper should head back some pear trees, without putting on any grafts from another tree, to see if the same results were obtained.

Trifolium abnormalities.—Mr. Fraser showed abnormal forms of *Trifolium*: *T. pratense* var. *parviflorum* with calyx teeth as long as the corolla tube, and *T. pratense* var. *proliferum* with proliferous flowers. *T. repens parviflorum*, (a) with corolla tube shorter than the calyx, (b) a form with the carpels developed into leaflets.

SCIENTIFIC COMMITTEE, JANUARY 29, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and seven other members present.

Juncus bufonius.—Mr. J. Fraser showed specimens of *Juncus bufonius* from various localities to illustrate the differences in growth which it exhibits, some in good, freshly-moved soil growing to about 12 inches in height. He also showed the variety *fascicularis* which has the flowers grouped in small clusters of two to four, whereas the type has flowers spaced singly.

The late Sir William Thiselton-Dyer.—The Committee learned with regret of the death of Sir William Thiselton-Dyer, and desired that its condolences should be communicated to Lady Thiselton-Dyer.

Fritillaria karadaghensis.—Messrs. Wallace of Tunbridge Wells showed a pan of *Fritillaria karadaghensis* from Northern Persia. It is a dwarf species with one or two terminal flowers coloured green, yellow and purple, with the perianth more basin-shaped than usual in the genus. A Botanical Certificate was recommended for this plant.

SCIENTIFIC COMMITTEE, FEBRUARY 12, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and seven other members present.

Sechium edule.—Mr. Preston showed a specimen of the one-seeded fruit of *Sechium edule* raised at Cambridge.

Daucus Carota.—Mr. Fraser drew attention again to the single red flower in the centre of the umbel of the Carrot as it usually occurs, and showed specimens in which this single flower was replaced by a small umbel. He thought this was probably the original condition of affairs.

The new President.—The Committee unanimously desired that its congratulations upon his appointment as President of the Society should be conveyed to Mr. G. W. E. Loder.

SCIENTIFIC COMMITTEE, FEBRUARY 26, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and four other members present.

Cones of Pinus Thunbergii.—Mr. Fraser showed on behalf of Mr. A. B. Jackson a piece of a branch of *Pinus Thunbergii* bearing 116 cones in a dense cluster. The branch had grown in the garden at Glengariff.

Fritillaria karadaghensis.—Messrs. Wallace of Tunbridge Wells showed a pan of *Fritillaria karadaghensis* from Northern Persia. It is a dwarf species with one or two terminal flowers coloured green, yellow and purple, and with the perianth more basin-shaped than usual in the genus. A Botanical Certificate was recommended for this plant.

SCIENTIFIC COMMITTEE, MARCH 12, 1929.

Sir DAVID PRAIN, F.R.S., V.M.H., in the Chair, ten other members and Mrs. LLOYD EDWARDS (visitor) present.

Romulea Linaresii.—Mrs. Lloyd Edwards showed a plant of this pretty species of *Romulea* which she had collected at Cyrenia in Cyprus last year. She also showed Orchids in flower from the same locality. They were species of *Ophrys* and possibly *O. scolopax* and *O. aranifera*.

Salix repens.—Mr. Fraser showed dried specimens of *Salix repens incubacea* and allied forms from Aberdeenshire and Surrey, and remarked upon the difficulty of recognition of these varieties in different stages of growth and development.

Malformed Cyripediums.—Mr. Worsdell wrote that he had examined the malformed *Cyripediums* sent to him from the last meeting and found that they appear to be cases of imperfect twinning, combined with a tendency to reversion, in which members of the androecium, which are normally suppressed, reappear. In one flower there were, too, double posterior sepals and two large staminodes, also an indication of a third (posterior) stamen of the outer whorl (?); the four-angled ovary shows the presence of more than three carpels; the corolla is normal. In the other flower there seems to be an extra-posterior sepal, and an extra lateral petal placed within the others; a third (anterior) stamen of the inner whorl seems to be present and fertile.

SCIENTIFIC COMMITTEE, MARCH 26, 1929.

Mr. F. J. HANBURY, F.L.S., V.M.H., in the Chair, and ten other members present.

Orchid from Venezuela.—An Orchid was referred to the Committee from the Orchid Committee, shown by Messrs. Charlesworth, and said to come from Venezuela. Mr. Cotton took it for examination at Kew.

Viola Pesneauii.—Mr. Fraser showed a series of dried specimens of forms of *V. lutea* and related forms including *V. Pesneauii*.

SCIENTIFIC COMMITTEE, APRIL 9, 1929.

Sir DAVID PRAIN, F.R.S., V.M.H., in the Chair, and nine other members present.

Pelezia maculata.—Mr. Cotton reported that the Orchid from Venezuela shown at the last meeting was *Pelezia maculata*, the native country of which had not hitherto been certain.

British plants.—Mr. Marsden-Jones showed specimens of *Draba aizoides* and *Veronica verna*, the latter found near Thetford in some abundance.

Orchid for naming.—Mr. Wood of Hayes showed an Orchid with brown flowers on a branching spike, flowering before the foliage from the naked pseudo-bulbs, collected in the interior of Africa behind Sierra Leone. Mr. Cotton took it for naming.

Sectorial chimera in Hyacinth.—Mr. J. F. Gosling, of 45 Underhill Road, East Dulwich, showed a Hyacinth of which half the spike bore blue, half-pink flowers. The phenomenon has been before the Committee before, and the colour variation is constant so long as the shoot is derived from the same side of the bulb.

British Violas.—Mr. Fraser showed varieties of *Viola tricolor* including *variata*, a variety near *sulphurea*, and *Lloydii*.

SCIENTIFIC COMMITTEE, APRIL 23, 1929.

Mr. F. J. HANBURY, F.L.S., V.M.H., in the Chair, and seven other members present.

Seeds for identification.—Dr. Voelcker showed a seed of a cucurbitaceous plant from Australia for identification. It proved to be *Zanonia macrocarpa*, a native of Java. He also showed seeds of a Leguminous plant from Chile (?) which, used for pig feeding, proved poisonous. They were referred to Kew for identification.

Salix hybrids.—Mr. J. Fraser showed a series of dried specimens of Willows with long catkins, including *Salix alba* × *vitellina*, *S. aurita* × *cinerea*, *S. aurita* × *repens*, etc.

Narcissus with upright flower.—Mr. Hales showed a Daffodil with the flower held quite erect instead of at an angle as is usual.

Subterranean fungus.—Mr. Preston showed a subterranean fungus called *Sepultaria sepulta*, closely allied to *Peziza*, and sometimes included in that genus.

Hyacinth with detached inflorescence.—Mr. Chittenden showed on behalf of Mr. D. Green a Hyacinth with the inflorescence still closely bunched, detached from the basal plate and carried up with the leaves. It is possible that sudden growth of the latter had broken the inflorescence away from its anchorage and carried it up with the leaves.

SCIENTIFIC COMMITTEE, MAY 6, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and ten other members present.

Crataegus monogyna forms.—Mr. Fraser showed various forms of *Crataegus monogyna* including the variety *laciniata*, var. *pteridifolia*, and var. *kyotostyla*. One had three pairs of lateral leaflets.

Damage by frosts, etc.—Prof. Armstrong drew attention to the damage done by the severe weather of the past winter and by the dry weather that had succeeded it. The Secretary pointed out that a collection of evidence was being made along the lines of previous frost reports.

Bellevalia mauritanica.—Mr. Hosking showed a plant of *Bellevalia mauritanica*.

SCIENTIFIC COMMITTEE, JUNE 11, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, seven other members and Mr. VAN DE WEYER (visitor) present.

Hybrid roses.—Mr. Fraser showed examples of Roses collected on Ham and Barnes Commons, viz. *Rosa* × *hibernica*, and *R.* × *glabra* (including a form of larger growth often called *Grovesii*). Mr. Fraser made some remarks upon each of these.

Fruit trees.—Mr. Worsley referred to the abundant flowering of fruit trees this spring, which he thought attributable not only to the sunny weather of last autumn but in a measure to the delayed flowering time this spring. It is probably true that the cold weather increased available food and caused more regular development of the flowers already formed.

Seedling of double Narcissus.—One plant among a batch of *Narcissus cernuus plenus* in Mr. Van de Weyer's garden at Dorchester produced a single flower in one year, as already reported; in all succeeding years the flowers of this plant have all been double. The flower was self-pollinated and produced seeds, and two of the resulting seedlings have now flowered, both giving double flowers.

Chimera in Helianthemum.—Mr. Van de Weyer also showed a shoot of a double red *Helianthemum* bearing one red flower and portions of others yellow, as is usual in sectorial chimeras.

Calceolaria uniflora.—Mr. Hay showed a plant of this Chilean species in a pan and it was recommended that a Botanical Certificate should be awarded to it. He also showed *Aquilegia canadensis*.

FRUIT AND VEGETABLE COMMITTEE.

JANUARY 15, 1929.

Mr. C. G. A. Nix, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sutton, Reading, for collection of vegetables.

Silver-gilt Hogg Medal.

To Messrs. Cheal, Crawley, for collection of Apples.

To Messrs. Bunyard, Maidstone, for collection of Apples.

Other Exhibits.

Mr. G. Wratten, Bembridge : seedling Apple.

Capt. Drummond, Southampton : seedling Apple.

Mr. A. C. Mills, Warwick : Apple for opinion.

Mrs. Fleming, Uxbridge : preserves.

Miss Millar, Loughborough : ' Millar's Seedling ' Apple.

FRUIT AND VEGETABLE COMMITTEE, JANUARY 29, 1929.

Mr. J. CHEAL, V.M.H., in the Chair, and nineteen other members present.

Awards Recommended :—

Silver-gilt Hogg Medal.

To University of Reading, for collection of Apples.

Other Exhibits.

N. Hanbury, Esq., Ware : Apple ' Munden Glory.'

Mr. H. Holfield, Abingdon : seedling Apple.

Miss H. G. Sewell, Kensington : preserves.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 12, 1929.

Mr. J. CHEAL, V.M.H., in the Chair, and ten other members present.

No awards were recommended on this occasion.

Exhibits.

Messrs. Bunyard, Maidstone : collection of Apples.

Messrs. Cheal, Crawley : collection of Apples.

Mr. G. King, Sidcup : Apple ' Bawden's Seedling.'

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 26, 1929.

Mr. J. CHEAL, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Sutton, Reading : for collection of vegetables.

Silver Knightian Medal.

To Messrs. Dobbie, Edinburgh : for collection of Potatoes.

Silver Hogg Medal.

To Messrs. Rivers, Sawbridgeworth : for collection of Citrus fruits.

Hogg Medal.

To Mr. A. H. Pullen, Wallington : for collection of Apples.

Other Exhibits.

Messrs. Bunyard, Maidstone : collection of Apples.

FRUIT AND VEGETABLE COMMITTEE, MARCH 12, 1929.

Mr. C. G. A. NIX, V.M.H., in the Chair, and sixteen other members present.

No awards were recommended on this occasion.

Exhibits.

Messrs. Sutton, Reading : collection of Onions.

Mr. G. Hill, Ash : seedling Apple.

FRUIT AND VEGETABLE COMMITTEE, MARCH 26, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and ten other members present.

No awards were recommended on this occasion.

Exhibits.

Messrs. Sutton, Reading : collection of Salad vegetables.

Messrs. Cheal, Crawley : collection of Apples.

The awards recommended by the sub-committee visiting Wisley to judge the trial of Dwarf French Beans, under glass, were confirmed.

DWARF FRENCH BEANS.

Under glass.

First-class Certificate.

46. 'Canadian Wonder Improved,' sent by Messrs. W. H. Simpson (= 'Flageolet Rouge,' not the large-seeded Canadian Wonder). Award recommended for earliest forcing.

Award of Merit.

32. 'Bounteous,' sent by Messrs. Watkins & Simpson.

53. 'Early Prolific,' sent by Messrs. J. Carter. } For earliest forcing.

55. 'Fifty Days,' sent by Messrs. J. Carter.

Highly Commended.

34. 'Perpetual,' sent by Messrs. J. Carter.

35. 'Monster Negro,' sent by Messrs. W. H. Simpson.

50. 'Earliest of All,' sent by Messrs. Nutting.

52. 'Early Warwick' (or 'Early Prolific'), sent by Messrs. Harrison.

56. 'Helmingham Early Prolific,' sent by Messrs. C. Orchard.

Commended.

10. 'Saxa,' sent by Messrs. Zwaan & van der Molen.

15. 'Ne Plus Ultra,' sent by Messrs. Kelway.

57. 'Langport Wonder,' sent by Messrs. Kelway.

FRUIT AND VEGETABLE COMMITTEE, APRIL 9, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and ten other members present.

No awards were recommended on this occasion.

Exhibit.

Mr. E. A. Bunyard, Maidstone : Apples 'Orleans Reinette,' 'Cox's Orange Pippin,' 'Blenheim Orange,' from underground store. Also specimens of 'Barnack Beauty' from South Africa.

FRUIT AND VEGETABLE COMMITTEE, APRIL 23, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and eleven other members present.

No awards were recommended on this occasion.

Exhibit.

Messrs. Cheal, Crawley : collection of Apples.

FRUIT AND VEGETABLE COMMITTEE, MAY 7, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and eleven other members present.

There was no business before the committee on this occasion.

FRUIT AND VEGETABLE COMMITTEE, MAY 21, 1929.

CHELSEA SHOW.

Mr. A. H. PEARSON, V.M.H., in the Chair, and seventeen other members present.

No awards were recommended on this occasion.

Exhibit.

Messrs. Bide, Farnham : Tomato 'Bide's N.C.O.'

FRUIT AND VEGETABLE COMMITTEE, JUNE 11, 1929.

Mr. W. POUPART, V.M.H., in the Chair, and eight other members present.

No awards were recommended on this occasion.

Exhibits.

Messrs. Bide, Farnham : Tomatos.

Mr. C. F. R. Weston, Bethersden : Apple for opinion.

The awards recommended by the sub-committee visiting Wisley to judge the trial of Rhubarb were confirmed.

RHUBARB.

Award of Merit.

* 'Hawke's Champagne,' sent by Mr. W. Poupart, Walton.

† 'The Sutton,' sent by Messrs. Sutton, Reading.

Highly Commended.

† 'Collis's Seedling,' sent by R.H.S., Wisley Gardens.

* 'Buck's Early Red,' sent by R.H.S., Wisley Gardens.

* 'Appleton's Forcing,' sent by Messrs. Appleton, Northwick.

* 'Cutbush's Seedling,' sent by Messrs. Cutbush, Barnet.

* 'Crimson Queen,' sent by Messrs. Kelway, Langport.

† 'The Streeter,' sent by The Hon. Vicary Gibbs, Elstree.

Commended.

'Laxton's No. 1,' sent by Messrs. Laxton, Bedford.

FRUIT AND VEGETABLE COMMITTEE, JUNE 25, 1929.

Mr. J. CHEAL, V.M.H., in the Chair, and eight other members present.

No awards were recommended on this occasion.

Exhibit.

Messrs. Sutton, Reading : collection of Lettuce.

* Award recommended for earliness.

† Award recommended as a late variety.

FLORAL COMMITTEE.

JANUARY 15, 1929.

Section A.

Mr. J. F. McLEOD in the Chair, and twelve other members present.

Awards Recommended :—*Silver Banksian Medal.*

To Messrs. Engelmann, Saffron Walden, for Carnations.
To The Hon. Vicary Gibbs (gr. Mr. E. Beckett), Elstree, for Poinsettias.

Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. S. Low, Enfield, for Carnations.

Award of Merit.

To Carnation 'Thomas Ives' for cutting (votes unanimous), from Messrs. S. Low, Enfield. A good bright cerise, perpetual-flowering variety. The flowers are large and measure 4 inches across. The petals are broad, serrated, and of good substance.

To Chrysanthemum 'New Year' for cutting (votes unanimous), from Mr. H. Shoesmith, jun., Mayford, Woking. A late-flowering golden-amber single variety with two rows of ray florets. The disc is surrounded by a definite yellow zone. The flower stems are long and stiff.

Other Exhibits.

Messrs. S. Low, Enfield : Carnation 'Kathleen.'
Mr. H. Shoesmith, jun., Mayford, Woking : Chrysanthemum 'Joan.'

* * *

Section B.

Mr. G. W. E. LODER, F.L.S., in the Chair, and sixteen other members present.

Awards Recommended :—*Banksian Medal.*

To Messrs. Barr & Son, Taplow, for shrubs and bulbous plants.
To Messrs. Low & Co., Enfield, for shrubs.
To Messrs. L. R. Russell, Ltd., for stove plants.
To Messrs. R. Veitch & Son, Exeter, for shrubs.
To Mr. G. G. Whitelegg, Chislehurst, for conifers.

Award of Merit.

To *Erica australis* 'Mr. Robert' as a hardy flowering shrub (votes 13 for, 1 against), from Messrs. R. Veitch & Son, Exeter. A very beautiful winter-flowering Heath with dark green foliage and large, pure white, tubular flowers. The plant exhibited had been grown without protection, but was, apparently, quite undamaged by exposure to severe frost.

Other Exhibits.

Mr. J. J. Klinkert, Richmond : clipped trees.
Mr. P. S. Patrick, Sevenoaks : shrubs.
Mr. Stephen Sims, Draycott : miniature shrubs.

FLORAL COMMITTEE, JANUARY 29, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, nineteen other members and Mr. J. FYFE SMITH, Vancouver (visitor), present.

Awards Recommended :—

Gold Medal.

To Messrs. Blackmore & Langdon, Bath, for Cyclamen.

Silver-gilt Banksian Medal.

To Messrs. Sutton, Reading, for flowering bulbs.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Banksian Medal.

To Messrs. Engelmann, Saffron Walden, for Carnations.

To Messrs. S. Low, Enfield, for Carnations.

Award of Merit.

To *Anthurium Rothschildianum* 'Excelsior' as a stove plant (votes 12 for, 1 against), from L. de Rothschild, Esq., Exbury. A variety with a large, round, creamy-white spathe, much speckled with light red. The spadix is reddish-orange and curled. The plant exhibited was grown by Messrs. Sanders, St. Albans.

To Carnation 'Kathleen' for market and cutting (votes unanimous), from Messrs. S. Low, Enfield. A light rose-pink perpetual-flowering variety of medium size and good form.

Other Exhibit.

Mrs. J. W. Philips, St. Albans : Carnation 'Mrs. Falkner.'

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Section B.

Mr. G. W. E. LODER, F.L.S., in the Chair, and twenty other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Cutbush, Barnet, for rock plants and shrubs.

To Mr. G. Reuthe, Keston, for shrubs.

Banksian Medal.

To Messrs. Barr, Taplow, for shrubs and bulbous plants.

To The Orpington Nursery Co., for shrubs.

To Mr. P. S. Patrick, Sevenoaks, for shrubs.

To Messrs. Russell, Richmond, for shrubs and stove plants.

To Messrs. Waterer, Sons & Crisp, Twyford, for rock plants and shrubs.

To Messrs. Wm. Wood & Son, Taplow, for rock plants and shrubs.

Other Exhibits.

Mr. J. J. Klinkert, Richmond : clipped trees.

Messrs. Low & Co., Enfield : shrubs.

Mr. S. Sims, Draycott : shrubs.

Messrs. Tucker, Oxford : alpine plants.

Mr. G. E. P. Wood, Ashted : shrubs.

FLORAL COMMITTEE, FEBRUARY 12, 1929.

Section A.

Mr. J. F. McLEOD in the Chair, and fifteen other members present.

Awards Recommended :—

Silver Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
- To Messrs. S. Low, Enfield, for Carnations.
- To Messrs. Sutton, Reading, for Cinerarias.
- To S. Walrock, Esq. (gr. Mr. W. H. Holloway), Stanmore, for Cinerarias.

Banksian Medal.

- To Messrs. Engelmann, Saffron Walden, for Carnations.
- To Napsbury Mental Hospital (gr. Mr. W. J. Jennings), St. Albans, for *Primula sinensis* vars.

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Section B.

Mr. G. W. E. LODER, F.L.S., in the Chair, and twenty other members present.

Awards Recommended :—

Silver Banksian Medal.

- To Messrs. Prichard, Christchurch, for rock plants and shrubs.
- To Messrs. Russell, Richmond, for shrubs.

Banksian Medal.

- To Messrs. Barr & Sons, Taplow, for shrubs and bulbous plants.
- To Messrs. Cheal, Crawley, for shrubs and rock plants.
- To Messrs. Cutbush, Barnet, for rock garden.
- To The Orpington Nursery Co. for shrubs.
- To Mr. G. G. Whitelegg, Chislehurst, for shrubs.
- To Messrs. Waterer, Sons & Crisp, Twyford, for shrubs and bulbous plants.
- To Messrs. Wm. Wood & Sons, Taplow, for shrubs and bulbous plants.

Award of Merit.

To *Gordonia anomala* as a tender flowering shrub (votes unanimous), from Lt.-Col. L. C. R. Messel, Handcross. A handsome Chinese shrub closely allied to the Camellias. The oblanceolate, crenate, dark green leaves are shortly stalked, and in the axils of the upper ones appear the large, almost sessile, creamy white flowers.

To *Rhododendron leucaspis* as a hardy flowering shrub (votes unanimous), from Lionel de Rothschild, Esq., Exbury. A small, branched shrub of spreading habit, shown under the number K.W. 6273. The leaves are dark green, elliptic, about 1½ inch long, clothed with spreading hairs, as are also the young stems. From terminal buds are produced pairs of flowers 2 inches in diameter. The flattened corolla is white except for a hint of sulphur at the throat. Contrast is afforded by the short, chocolate-tipped stamens.

Other Exhibits.

- Messrs. Hodson, Nottingham : rock plants and shrubs.
- Messrs. Hollamby, Groombridge : rock plants and shrubs.
- Misses Hopkins, Coulsdon : rock plants.
- Messrs. Low, Enfield : shrubs.
- Lye Green Nurseries, Chesham : rock plants.
- Mr. P. S. Patrick, Sevenoaks : shrubs.
- Messrs. Tucker, Oxford : rock plants.
- Mr. G. E. P. Wood, Ashted : shrubs.

FLORAL COMMITTEE, FEBRUARY 26, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Engelmann, Saffron Walden, for Carnations.
To Messrs. S. Low, Enfield, for Carnations.

Banksian Medal.

To Misses Allen-Brown, Henfield, for Violets and Carnations.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. G. Prince, Longworth, for Roses.

Other Exhibit.

Messrs. S. Low, Enfield : Cyclamen 'Low's Purple.'

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Section B.

Mr. G. W. E. LODER, F.L.S., in the Chair, and twenty other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Barr & Son, Covent Garden, for bulbous plants.
To Messrs. Prichard, Christchurch, for shrubs and rock plants.
To Messrs. Wm. Wood & Son, Taplow, for shrubs and rock plants.

Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs and rock plants.
To Messrs. Cutbush, Barnet, for shrubs.
To Messrs. Hillier, Winchester, for shrubs.
To Messrs. Low, Enfield, for shrubs.
To Messrs. Russell, Richmond, for shrubs.
To Messrs. Stewart, Ferndown, for shrubs and rock plants.
To Messrs. Waterer, Sons & Crisp, Twyford, for shrubs and rock plants.

Other Exhibits.

R. Barclay Fox, Esq., Falmouth : shrubs.
Misses Hopkins, Coulsdon : rock plants.
E. G. Hunt, Esq., Basingstoke : *Rhododendron* sp. K.W. 6279.
Sir Wm. Lawrence, Bt., Burford : *Rhabdothamnus Solanderi*.
Lye Green Nurseries, Chesham : rock plants.
Mr. P. S. Patrick, Sevenoaks : rock plants and shrubs.
Messrs. Prichard, Christchurch : Saxifrage 'His Majesty.'
Mr. Thirkildsen, Southport : rock plants.
Messrs. Russell, Richmond : *Amygdalus persica* 'Russell's Red.'
Messrs. Wallace & Co., Tunbridge Wells : *Fritillaria karadaghensis*.

FLORAL COMMITTEE, MARCH 12, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, eighteen other members and Mr. W. CHAMPION HACKETT, Adelaide (visitor), present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. G. H. Dalrymple, Bartley, for Freesias.
To Messrs. Sutton, Reading, for Hyacinths

Banksian Medal.

To Messrs. Cutbush, Barnet, for Freesias.
 To Messrs. Engelmann, Saffron Walden, for Carnations.
 To Messrs. S. Low, Enfield, for Carnations, and Cyclamen.
 To Mr. G. Prince, Longworth, for Roses.

Award of Merit.

To *Clivia* 'Ursula' as a greenhouse pot plant (votes 11 for, 4 against), from the Hon. R. James, Richmond, Yorks. The plant to which the award was given carried a fine umbel of eighteen large, wide-open, rounded, light orange flowers with primrose-yellow throats.

To *Freesia* 'Beauty' for cutting and market (votes unanimous), from Mr. G. H. Dalrymple, Bartley. Height 21 inches; seven flowers to the spike, five out at a time; flowers $1\frac{1}{2}$ inch diameter, rosy-mauve.

To *Freesia* 'Maryon' for cutting and market (votes 19 for), from Mr. G. H. Dalrymple, Bartley. Height 24 inches; six flowers to the spike, three out at a time; flowers $1\frac{1}{2}$ inch diameter, lavender-mauve, throat white.

To *Freesia* 'Mrs. R. F. Felton' for cutting and market (votes unanimous), from Mr. G. H. Dalrymple, Bartley. Height 24 inches; seven flowers to the spike, sometimes eight, five out at a time; flowers $1\frac{1}{4}$ inch diameter, creamy-white.

Other Exhibits.

Mrs. Carl Holmes, Welwyn: Anthuriums.

R.H.S. Gardens, Wisley: Lachenalias 'Brightness' (Carter), 'Chaffinch' (Mauger), 'Haarlem' (Mauger), from the Wisley trial.

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Section B.

Mr. G. W. E. LODER, F.L.S., in the Chair, twenty-three other members and Mr. J. COMBER (visitor) present.

Awards Recommended:—*Silver Banksian Medal.*

To Messrs. Prichard, Christchurch, for shrubs and rock plants.
 To Mr. G. Reuthe, Keston, for shrubs.
 To Messrs. Russell, Richmond, for shrubs.
 To Messrs. Stewart, Ferndown, for rock plants.
 To Messrs. Wallace, Tunbridge Wells, for shrubs and rock plants.

Banksian Medal.

To Messrs. Barr & Sons, Covent Garden, for shrubs and rock plants.
 To Messrs. Casburn & Welch, Cambridge, for rock plants.
 To Messrs. Cutbush, Barnet, for shrubs.
 To Messrs. Elliott, Stevenage, for rock plants.
 To Messrs. Low, Enfield, for shrubs.
 To Mr. P. S. Patrick, Sevenoaks, for shrubs.
 To Messrs. Waterer, Sons & Crisp, Twyford, for shrubs and rock plants.
 To Messrs. Wood, Taplow, for rock plants.

Certificate of Cultural Commendation.

To Mr. Wm. Lowe, gardener to the Hon. Mrs. Ryder, Durns, Beaulieu, for *Leucadendron plumosum*.

Other Exhibits.

Lady Aberconway and the Hon. H. D. McLaren, Bodnant: *Rhododendron telopoeum*.

Messrs. Barr & Sons, Covent Garden: *Fritillaria imperialis cashmiriana*, *F. verticillata Thunbergii*.

Messrs. Hollamby, Groombridge: shrubs and rock plants.

Misses Hopkins, Coulsdon: rock plants.

J. Spencer Lewis, Esq., Wargrave: *Pasithea coerulea*.

Mr. G. Wood, Ashted: shrubs and rock plants.

FLORAL COMMITTEE, MARCH 26, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, seventeen other members and Mr. W. CHAMPION HACKETT, Adelaide (visitor), present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Dobbie, Edinburgh, for Cinerarias.

Silver Banksian Medal.

To The Hon. Marshall Brooks (gr. Mr. A. Carter), Tarporley, for Clivias.
To Mr. G. H. Dalrymple, Bartley, for Freesias.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. S. Low, Enfield, for Carnations.
To The Duke of Wellington (gr. Mr. H. J. Beckingham), Basingstoke, for Cinerarias, Primulas, etc.

Banksian Medal.

To Messrs. Engelmann, Saffron Walden, for Carnations.
To Messrs. Gill, Falmouth, for Anemones and Arums.
To Mr. G. Prince, Longworth, for Roses.
To Messrs. Sutton, Reading, for Crocuses.

Selected for trial at Wisley.

Primula 'Peakland Beauty' from D. B. Milne, Esq., South Darley, nr. Matlock.

Other Exhibits.

Mr. B. Pinney, Shipbourne : Violets.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, twenty-three other members and Mr. J. COMBER (visitor) present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Elliott, Ltd., Stevenage, for alpine plants.

Silver Banksian Medal.

To Messrs. Casburn & Welch, Cambridge, for rock garden.
To Messrs. Gill, Falmouth, for Rhododendrons.
To Mr. Gavin Jones, Letchworth, for rock plants.
To C. Kirch, Esq., Beckenham, for rock plants.
To Messrs. Prichard, Christchurch, for rock plants.
To Mr. G. Reuthe, Keston, for shrubs.
To Messrs. Stewart, Ferndown, for rock plants and shrubs.
To Messrs. Tucker, Oxford, for rock plants and shrubs.
To Messrs. Veitch, Exeter, for shrubs.
To Messrs. Waterer, Sons & Crisp, Twyford, for rock plants and shrubs.

Banksian Medal.

To Messrs. Barr, Taplow, for rock plants.
To Messrs. Cutbush, Barnet, for shrubs.
To Messrs. Low, Enfield, for shrubs.
To the Rev. Rollo Meyer, Hertford, for bulbous lilies.
To Messrs. Rogers, Southampton, for rock plants and shrubs.
To Messrs. Russell, Richmond, for shrubs

Award of Merit.

To *Leucocoryne ixioide odorata* as a flowering bulb for the cool greenhouse (votes unanimous), from Messrs. C. Elliott, Ltd., Stevenage. A Liliaceous plant collected in Chile by Mr. Elliott, requiring the same treatment as the Freesia. The foliage is thin and grass-like, and the flowers, which are reminiscent in size and colour of those of *Chionodoxa gigantea*, are borne in clusters, usually of four or five, on long, slender scapes. The flowers are pleasantly scented.

To *Rhododendron euchaetes* as a hardy flowering shrub (votes unanimous), from Lady Aberconway and the Hon. H. D. McLaren, Bodnant. A species collected by Forrest (No. 12125) and Ward (No. 3040). The narrow-campanulate flowers are arranged in flattish trusses. The corolla and large fringed calyx are both rich ruby-red. The leaves are rather small, oblong, dark green above and glaucous beneath.

To *Rhododendron* 'Delight' as a hardy flowering shrub (votes unanimous), from Messrs. R. Gill & Son, Falmouth. This hybrid was raised from the cross *R. ciliatum* × *R. praecox*. It forms a spreading, floriferous bush with small dark green leaves and clusters of flowers in pairs or threes. The flowers are similar in colour to those of *R. ciliatum*, but of smaller size.

Other Exhibits.

Lady Aberconway and the Hon. H. D. McLaren, Bodnant: *Rhododendron* 'Astarte.'

Messrs. Burkwood & Skipwith, Kingston: *Viburnum* × *Burkwoodii*.

Messrs. Cheal & Son, Crawley: rock plants.

H. McD. Edleston, Esq., Lindfield: *Crocus* 'Columbine,' C. 'Harlequin.'

Messrs. Elliott, Stevenage: *Calceolaria* sp.

Messrs. Gill, Falmouth: *Rhododendron* K.W. 6278.

Messrs. Hodson, Mapperley: shrubs.

Messrs. Hollamby, Groombridge: shrubs.

Misses Hopkins, Coulsdon: rock plants.

Sir Wm. Lawrence, Bt., Burford: *Arctotis breviscapa*, *A. rudis*.

Mr. P. S. Patrick, Sevenoaks: shrubs.

Messrs. Pulham, Bishop's Stortford: rock plants.

Mr. K. Thirkildsen, Southport: rock plants.

Mr. G. G. Whitelegg, Chislehurst: shrubs and rock plants.

Mr. G. E. P. Wood, Ashted: rock plants.

FLORAL COMMITTEE, APRIL 9, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen other members present.

Awards Recommended:—*Silver-gilt Banksian Medal.*

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. G. H. Dalrymple, Bartley, for Freesias.

To Messrs. Engelmann, Saffron Walden, for Carnations.

Silver Banksian Medal.

To Messrs. Blackmore & Langdon, Bath, for Schizanthus.

To Messrs. Cutbush, Barnet, for Roses.

To Mr. E. J. Hicks, Twyford, for Roses.

To Mr. H. G. Longford, Abingdon, for Daffodils and Primroses.

To Mr. J. H. Pemberton, Havering, for Roses.

To Mr. G. Prince, Longworth, for Roses.

Banksian Medal.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. S. Low, Enfield, for Carnations.

To Mr. G. W. Miller, Wisbech, for Polyanthus, etc.

To C. Scrase Dickens, Esq., Horsham, for Hellebores.

Other Exhibits.

Miss E. Armitage, Ross: *Primula juliae* hybrid.

Mr. B. Pinney, Shipbourne: Violets.

Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, twenty-two other members and Mr. J. COMBER (visitor) present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Elliott, Ltd., Stevenage, for alpine plants.

Silver Banksian Medal.

To Messrs. Low & Co., Enfield, for shrubs.

Banksian Medal.

To Messrs. Baker, Codsall, for shrubs and rock plants.
 To Messrs. Barr & Son, Taplow, for shrubs and rock plants.
 To Messrs. Maxwell & Beale, Broadstone, for shrubs and rock plants.
 To Messrs. Prichard, Christchurch, for rock plants.
 To Messrs. Pulham, Bishop's Stortford, for rock plants.
 To Messrs. Rogers, Southampton, for rock plants.
 To Messrs. Russell, Richmond, for shrubs.
 To Mr. S. Sims, Draycott, for shrubs and rock plants.
 To Messrs. Stewart, Ferndown, for shrubs and rock plants.
 To Messrs. Tucker, Oxford, for rock plants.
 To Messrs. Waterer, Sons & Crisp, Twyford, for shrubs and rock plants.
 To Messrs. Wm. Wood & Son, Taplow, for shrubs and rock plants.

Lindley Medal.

To R. Bevan, Esq., Henley, for alpine plants.

Award of Merit.

To *Marica gracilis* as a flowering plant for the stove (votes 8 for, 3 against), from Sir Wm. Lawrence, Bt., Burford. An uncommon Brazilian Irid with beautiful but fugacious flowers. The drooping, oblanceolate falls are pure white, about 2 inches long : the standards bright blue, recurved, heavily veined with chocolate at the haft. The lax green foliage attains a height of 18 inches. Propagation is effected by means of buds which develop at the apices of the single-flowered scapes.

To *Viburnum* × *Burkwoodii* as a hardy flowering shrub (votes unanimous), from Messrs. Burkwood & Skipwith, Kingston-on-Thames. Raised from a cross between *V. Carlesii* and *V. utile*, this hybrid is of intermediate habit. The foliage is evergreen, the flowers rather smaller than those of *V. Carlesii*, white, and sweetly scented.

Other Exhibits.

Lady Aberconway and the Hon. H. D. McLaren, Bodnant : *Rhododendron calophytum*.

Messrs. Burkwood & Skipwith, Kingston : *Osmarea* × *Burkwoodii*.

Viscountess Byng of Vimy, Thorpe-le-Soken : *Lithophragma heterophylla*.

Mr. John Hall, Cambridge : *Primula denticulata Hallii*.

Messrs. Hollamby, Groombridge : shrubs and rock plants.

Misses Hopkins, Coulsdon : rock plants.

Lt.-Col. Messel, Handcross : *Berberis linearifolia* (Comber 797). A beautiful species. Leaves narrow, spiny-margined, evergreen. Axillary racemes 10-12-flowered. Flowers apricot, fruit blue-black. Height 4 to 10 feet.

Mrs. Milford, Chedworth : rock plants.

Mr. P. S. Patrick, Sevenoaks : shrubs and rock plants.

E. M. Preston, Esq., Hayes : *Camellia latifolia*.

Mr. G. E. P. Wood, Ashted : rock plants.

FLORAL COMMITTEE, APRIL 23, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and fifteen other members present.

Awards Recommended :—*Silver-gilt Banksian Medal.*

To Messrs. Allwood, Haywards Heath, for Carnations.
 To Mrs. Bucknall, Doneraile, for Anemones.
 To S. Wallrock, Esq. (gr. Mr. W. H. Holloway), Stanmore, for Schizanthus.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
 To Messrs. Cutbush, Barnet, for Roses.
 To Mr. G. H. Dalrymple, Bartley, for Freesias and Primulas.
 To Messrs. Engelmann, Saffron Walden, for Carnations.
 To Fanny Lady Leon (gr. Mr. W. Sorrell), Bletchley, for Cinerarias.
 To Studley College, Warwickshire, for Schizanthus and Stocks.
 To Mr. C. Wall, Bath, for Aquilegias.

Banksian Medal.

To Messrs. F. Cant, Colchester, for Roses.
 To Mr. E. J. Hicks, Twyford, for Roses.
 To Messrs. S. Low, Enfield, for Carnations.
 To Mr. G. W. Miller, Wisbech, for Primroses, Polyanthus, and Daffodils.
 To Mr. J. H. Pemberton, Havering, for Roses.

Award of Merit.

To *Anemone* 'Mary Seton' for cutting and market (votes 7 for, 3 against), from Mrs. M. B. Henderson Bull, Falmouth. A beautiful hardy *Anemone* of the 'St. Brigid' type. The flowers are very large and of a pleasing rose-pink shade with a white central zone.

To *Dianthus* × *Allwoodii* 'Prudence' for cutting (votes unanimous), from Messrs. Allwood, Haywards Heath. The height of this *Dianthus* is about 1 foot. The salmon-pink flowers are very fragrant and are produced with very great freedom.

To *Hippeastrum* 'Lady Juliet Duff' as a greenhouse pot plant (votes unanimous), from Lady Juliet Duff (gr. Mr. H. Weaver), Kingston Hill. A variety with very large handsome deep crimson flowers.

Other Exhibits.

Messrs. Baker, Codsall : *Primula* 'Pam.'
 Mr. E. Ballard, Colwall : *Violas*.
 Sir R. Biffin, Cambridge : *Primula* 'Julia Jones.'
 Messrs. Dobbie, Edinburgh : *Schizanthus* 'Dr. Badger's Hybrids.'
 Edrom Nurseries, Berwickshire : *Primroses*.
 Lady Gregory, Shoreham : *Carnations*.
 Mr. B. Pinney, Shipbourne : *Violets*.
 Messrs. Reamsbottom, West Drayton : *Anemones*.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, fifteen other members, the MARQUESS OF HARTINGTON, J. G. MILLAIS, and T. W. TAYLOR (visitors) present.

Awards Recommended :—*Silver Banksian Medal.*

To Messrs. Cheal, Crawley, for shrubs.
 To Messrs. Hillier, Winchester, for shrubs.
 To Messrs. Stuart Low, Enfield, for shrubs.
 To Messrs. Prichard, Christchurch, for shrubs and rock plants.

1 PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Banksian Medal.

- To Messrs. Casburn & Welch, Cambridge, for rock plants and shrubs.
- To Messrs. Elliott, Stevenage, for alpine plants.
- To Mr. Hemsley, Crawley, for shrubs and rock plants.
- To Messrs. Rogers, Southampton, for shrubs and rock plants.
- To Messrs. Russell, Richmond, for stove plants.
- To Messrs. Tucker, Oxford, for rock plants and shrubs.
- To Messrs. Waterer, Sons & Crisp, Twyford, for rock plants and shrubs.

Lindley Medal.

- To C. Kirch, Esq., Beckenham, for alpine plants.

Award of Merit.

To *Astragalus utahensis* as a hardy flowering plant (votes unanimous), from C. T. Musgrave, Esq., Godalming. A silver-foliaged Milk Vetch of prostrate habit, suitable for the rock garden. The purple flowers are successively produced in axillary racemes.

To *Mertensia molkoides* as a hardy flowering plant (votes unanimous), from T. Hay, Esq., Hyde Park. A charming and valuable alpine plant, forming a dense cushion of softly hairy foliage 2 to 3 inches high. At flowering time the leaves are almost hidden by numerous clusters of small, starry, sky-blue blossoms.

Certificate of Cultural Commendation.

- To Mr. F. G. Preston, Cambridge Botanic Garden, for *Rosa gigantea*.

Other Exhibits.

- Messrs. Baker, Codsall : rock plants and shrubs.
- Lt.-Col. C. H. Grey, Cranbrook : *Mertensia virginica*, *Polygala myrtifolia*.
- Messrs. Hollamby, Groombridge : shrubs and rock plants.
- C. Ingram, Esq., Benenden : *Prunus serrulata* 'Tai Haku.'
- Mr. W. E. T. Ingwerson, Sharpthorne : rock plants.
- Messrs. Maxwell & Beale, Broadstone : shrubs and rock plants.
- Sir John Ramsden, Bt., Gerrard's Cross : *Rhododendron* spp.
- Mr. Stephen Sims, Draycott : shrubs and rock plants.

RHODODENDRON ASSOCIATION'S SHOW, APRIL 30, 1929.

Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—

Award of Merit.

To *Rhododendron Keiskei* as a hardy flowering shrub (votes unanimous), from Mr. Harry White, Windlesham. A dwarf, evergreen species, first introduced from Japan in 1908. Its loose trusses, each bearing two to five pale yellow flowers, recall *R. lutescens*, but the compact habit of *R. Keiskei* makes it the more desirable plant.

To *Rhododendron semantemum* as a hardy flowering shrub (votes 8 for, 3 against), from Mr. Harry White. This is a very dwarf Lapponicum species. The plants exhibited were 3 or 4 inches high, little rounded tufts of dark green foliage studded with violet, red-stamened flowers. Collected by Forrest in S.W. Szechuan.

To *Rhododendron tephrolepium* as a hardy flowering shrub (votes 7 for), from Lady Aberconway and the Hon. H. D. McLaren, Bodnant. This forms an erect bush with clusters of small, glossy, lanceolate leaves and rather lax, rounded heads of flowers. The small, well-defined calyx is green, the corolla pale, rather transparent pink. A distinct species of the Boothii series, collected by Farrer in Upper Burma.

To *Rhododendron* 'Mrs. W. C. Slocock' as a hardy flowering shrub (votes 7 for, 1 against), from Messrs. W. C. Slocock, Woking. A *Campylocarpum* hybrid, forming a large bush. The abundant foliage is glossy and ornamental. The flowers are soft yellow, flushed with rose, the unopened buds pink. An attractive variety.

Other Exhibits.

- Messrs. W. H. Rogers, Southampton : Azalea 'Bassett Carmine.'
- Lionel de Rothschild, Esq., Exbury : *Rhododendron* 'Lady Foster.'
- Messrs. Slocock, Woking : *Rhododendrons*.
- Major Unnerton, Roehampton : *Rhododendron* \times *fragrantissimum*.

FLORAL COMMITTEE, MAY 7, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen other members present.

Awards Recommended :—*Silver-gilt Banksian Medal.*

To Mrs. Walter Burns (gr. Mr. G. H. Wright), North Mymms, for Hippeastrums.

To Messrs. Sander, St. Albans, for Anthuriums and Dendrobiums.

To Messrs. Sutton, Reading, for Nemesias.

Silver Banksian Medal.

To Messrs. B. Cant, Colchester, for Roses.

To Mr. A. Dawkins, Chelsea, for Calceolarias.

To Mr. J. Douglas, Great Bookham, for Auriculas.

To Messrs. Engelmann, Saffron Walden, for Carnations.

To Mr. E. J. Hicks, Twyford, for Roses.

To Messrs. Ladhams, Southampton, for herbaceous plants.

To Mr. J. H. Pemberton, Havering, for Roses.

Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. S. Low, Enfield, for Hippeastrums and other greenhouse plants.

To Mr. G. W. Miller, Wisbech, for Primroses and Polyanthus.

To D. B. Wilkinson, Esq., Chertsey, for Schizanthus.

*Award of Merit.*To *Anthurium* 'Ne Plus Ultra' as a stove plant (votes unanimous), from Messrs. Sander, St. Albans. A very broad scarlet variety with a deep orange curled spadix.

To Carnation 'Guy Allwood' for cutting and market (votes 12 for), from Messrs. Allwood, Haywards Heath. A bright salmon-pink perpetual-flowering Carnation resulting from a cross between the varieties 'Laddie' and 'Eileen Low.' The flowers are large and of good form with broad evenly serrated petals.

Selected for trial at Wisley.

Double Primroses and Polyanthus from P. Murray Thomson, Esq., Hereford.

Other Exhibits.Sqd. Commander J. Bird, Bassett : *Calceolaria Birdii*.

Messrs. Bloom, Oakington : hardy plants.

Messrs. Cheal, Crawley : Dahlias.

Messrs. C. Elliott, Stevenage : *Mimulus* 'Bronze Giant.'

Mrs. Fremantle, Penn : Polyanthus.

Mr. G. W. Miller, Wisbech : Primrose 'Helen Greet.'

Mr. B. Pinney, Shipbourne : Violets.

E. Wettern, Esq. (gr. Mr. A. Carter), Croydon : Cinerarias.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, fourteen other members, and the MARQUESS OF HARTINGTON (visitor) present.

Awards Recommended :—*Silver Banksian Medal.*

To Messrs. Casburn & Welch, Cambridge, for alpine plants.

To Messrs. C. Elliott, Stevenage, for alpine plants.

To Mr. Gavin Jones, Letchworth, for rock garden.

To Messrs. Prichard, Christchurch, for shrubs and rock plants.

Banksian Medal.

To Messrs. Baker, Codsall, for shrubs and rock plants.

To Messrs. Maxwell & Beale, Broadstone, for rock plants.

lii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

To Messrs. Rogers, Southampton, for shrubs and rock plants.

To Messrs. Russell, Richmond, for shrubs.

To Messrs. Waterer, Sons & Crisp, Twyford, for shrubs and rock plants.

Award of Merit.

To *Loasa acanthifolia* as a hardy annual flowering plant (votes unanimous), from Messrs. Elliott, Stevenage. An interesting Chilean plant of a genus rare in cultivation. The large pinnately-divided leaves are dark green and possess strong stinging bristles. The nodding orange flowers are 2 inches in diameter, the five petals incurved and partially enclosing the stamens.

To *Prunus nana* as a hardy flowering shrub (votes unanimous), from Mrs. Philip Martineau, Ascot. A well-known dwarf species flowering early and profusely on slender erect growths. The present bright pink form was collected in Roumania by the exhibitor.

To *Ramondia Natahæ* as a hardy flowering plant for the rock garden (votes unanimous), from Mark Fenwick, Esq., Stow-on-the-Wold. This is probably the finest of the Ramondias and forms a flat rosette of brilliant foliage surmounted by numerous erect flower-stalks. The flowers are of bright lavender-blue, contrasting strongly with the cluster of orange stamens at the centre. An unusually fine specimen was exhibited.

To *Tropaeolum azureum* as a tender flowering climber (votes 10 for, 1 against), from Messrs. Elliott, Stevenage. A slender Chilean climber, suitable for the cool greenhouse. The small sage-green leaves are deeply 5-lobed, the flowers small, of green calyx and spreading blue corolla with five bifid petals.

Other Exhibits.

Lady Aberconway and the Hon. H. D. McLaren, Bodnant : *Rhododendron* sp. K.W. 5843.

R. Bevan, Esq., Henley : *Polemonium confertum*.

Lt.-Col. C. H. Grey, Cranbrook : *Calceolaria nudicaulis*.

Lady Gurney, Walsingham : *Albuca* sp.

Collingwood Ingram, Esq., Benenden : *Prunus serrulata* vars.

Mrs. Marsden-Jones, Potterne : *Primula cyanantha*.

Lt.-Col. Messel, Handcross : *Rhododendrons*.

Dr. A. H. Williams, Horsham : *Veronica Allanii*.

The Misses Hopkins, Coulsdon : rock plants.

Mr. P. S. Patrick, Sevenoaks : shrubs.

Mr. S. Sims, Draycott : rock plants.

Mr. G. G. Whitelegg, Chislehurst : rock plants.

FLORAL COMMITTEE, MAY 21, 1929.

Section A.

AT CHELSEA.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen other members present.

Awards Recommended :—

Award of Merit.

To Begonia 'Mrs. Raeburn Mann' as a greenhouse plant (votes unanimous), from Messrs. Blackmore & Langdon, Bath. An excellent tuberous-rooted variety with large double bright pink flowers.

To Rose 'Barbara Richards' for cutting (votes 8 for), from Messrs. Alex. Dickson, Newtownards. A good fully double H.T. variety of nice form and with some fragrance. The creamy-white broad recurving petals are flushed with yellowish-buff at the centre.

To *Statice profusa superba* as a greenhouse plant (votes 14 for), from Mr. W. Chandler, Rolvenden Nurseries, Rolvenden. A very much improved and exceptionally free-flowering form of *S. profusa*. The conspicuous calyces are purple and the small corollas white.

Selected for trial at Wisley.

Dianthus Allwoodii alpina 'Wendy' from Messrs. Allwood, Haywards Heath.
Viola 'Alison' from Little Munden Nurseries, Ware.

Other Exhibits.

Mr. E. Benary, Erfurt : *Papaver nudicaule* 'Golden Orange.'
 Messrs. B. R. Cant, Colchester : Roses.
 Messrs. F. Cant, Colchester : Roses.
 Mr. T. Carlile, Twyford : *Viola gracilis* 'Loddon Primrose.'
 Messrs. Chaplin, Waltham Cross : Roses.
 Mrs. R. Davies, Cheltenham : *Cheiranthus* 'Mrs. Richard Davies.'
 Messrs. Elliott, Stevenage : *Mimulus* 'Painted Lady.'
 Messrs. Engelmann, Saffron Walden : Carnations.
 Messrs. Gibson, Leeming Bar : *Trollius* 'Golden Monarch.'
 Messrs. Kelway, Langport : *Pyrethrum* 'Mrs. James Kelway.'
 Col. Kemmis, Lyminster : *Primula* 'Mrs. Kemmis.'
 Messrs. S. Low, Enfield : *Carnation* 'Joyce Low.'
 L. Mills, Esq., Welling : *Marguerite* 'Creswick.'
 Mrs. A. J. Palmer, Fairford : *Carnation* 'Cecilia, Fairford Park variety.'
 Messrs. Reeves, Norwich : *Rose* 'Little Dorrit.'
 Messrs. Slidrecht, Boskoop : *Polyantha* Roses.
 Mr. G. Zambra, Dawlish : *Violas*.

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Section B.

Mr. W. J. BEAN, V.M.H., in the Chair, sixteen other members and Messrs. J. COMBER, T. W. TAYLOR, J. J. CROSFIELD, J. G. MILLAIS, and W. IRVING (visitors) present.

Awards Recommended :—*First-class Certificate.*

To *Magnolia* × *Brozzonii* as a hardy flowering shrub (votes unanimous), from Lionel de Rothschild, Esq., Exbury. A handsome hybrid of *M. liliiflora* × *M. soulangeana*. Its large, strongly-scented flowers are white, lightly flushed with purplish-rose near the base.

To *Rhododendron* 'Vanessa' as a hardy flowering shrub (votes unanimous), from Lady Aberconway and the Hon. H. D. McLaren, Bodnant. A variety of good habit, flowering while young. The rather widely-expanded, soft pink flowers are carried in somewhat loosely-packed trusses.

Award of Merit.

To *Aponogeton leptostachyum* as a tender aquatic flowering plant (votes 6 for, 3 against), from Mr. Amos Perry, Enfield. A very charming Pondweed. The lanceolate floating leaves are about 2 inches long, and the mauve flowers are borne in bifid inflorescences.

To *Daphne tangutica* as a hardy flowering shrub (votes unanimous), from Messrs. Bees, Ltd., Chester. This half-evergreen species is of Chinese origin. The specimens shown were very leafy and bore numerous fragrant flowers. The spreading corollas are white within, purple on the outside.

To *Dodocatheon Meadia* 'Brilliant' as a hardy flowering plant (votes unanimous), from Mr. Amos Perry, Enfield. A good variety of somewhat compact growth. The large flowers are bright rosy-purple and are produced freely.

To *Ourisia alpina* as a hardy flowering plant (votes unanimous), from Captain McEacharn, Wigtownshire. A charming and uncommon species. From a flattish rosette of dark green serrate leaves rise the sparingly-branched inflorescences, each bearing several pairs of large mauve-pink flowers on purplish pedicels.

To *Paeonia Mlokosewitschii* as a hardy flowering plant (votes unanimous), from Captain Jenkinson, Windsor Forest. An uncommon yellow-flowered species. The flowers are cup-shaped, of a pleasing soft shade. The foliage is massive and ornamental.

To *Primula* 'Sir George Thursby' as a hardy flowering plant (votes unanimous), from Mr. G. H. Dalrymple, Bartley. A hybrid of great vigour. The dark crinkled leaves form bold tufts from which rise strong, many-whorled stalks of deep pink, crimson-shaded flowers.

To *Rhododendron* 'Fortune's Triumph' as a hardy flowering shrub (votes unanimous), from G. H. Johnstone, Esq., Grampound Road, Cornwall. This variety has rather closely-arranged trusses of pink, carmine-spotted flowers.

To *Rhododendron* 'Muriel Messel' as a hardy flowering shrub (votes unanimous), from Lt.-Col. Messel, Handcross. A hybrid of unusual charm, the

parentage of which is stated to be *R. Loderi* × *R. 'Loder's White.'* From bright pink buds expand well-disposed flowers of exquisite shape and delicate colouring.

Other Exhibits.

Lady Aberconway and the Hon. H. D. McLaren, Bodnant: *Rhododendron 'Elsie Phipps,' R. sino-Nuttallii*, *Primula* hybrids.
Messrs. Burkwood & Skipwith, Kingston: *Cytisus 'Geoffrey Skipwith.'*
Mr. T. Carlile, Twyford: *Veronica austriaca*.
The Donard Nursery Co., Co. Down: *Pernettya 'Bell's Seedling.'*
Messrs. Elliott, Stevenage: *Godetia sp., Calceolaria nudicaulis*.
Mark Fenwick, Esq., Stow-on-the-Wold: *Jankaea Heldreichii*.
Major Harrison, Bury: *Scyphanthus elegans*.
Collingwood Ingram, Esq., Benenden: *Prunus 'Daikoko.'*
Messrs. Ingwerson, Sharpthorne: *Armeria Wilkommi, A. pubigera hirta*,
Phlox 'Camla.'
G. H. Johnstone, Esq., Grampound Road: *Rhododendrons*.
The Director, R.B.G., Kew: *Saxifraga × potternensis*.
C. Kirch, Esq., Beckenham: *Androsace cylindrica*.
Sir Wm. Lawrence, Bt., Burford: *Berberis Nevini, B. empetrifolia, Viola septentrionalis, Ribes lacustre*.
Mrs. R. A. Malby, Woodford: *Ribes Lobbii*.
Mrs. Philip Martineau, Ascot: *Sprekelia formosissima*.
Lt.-Col. Messel, Handcross: *Rhododendrons*.
B. O. Mulligan, Esq., Belfast: *Primula × chunglenta*.
Messrs. Reeves, Ltd., Norwich: *Crataegus variegata*.
Messrs. Rogers, Southampton: *Cupressus obtusa minima*.
R. D. Trotter, Esq., Ockley: *Campanula rupicola*.
Messrs. Tucker, Oxford: *Saxifrage 'Monreith Seedling.'*
Messrs. Watson & Sons, Killiney: *Cytisus 'Hibernia,' C. 'Eblana.'*

FLORAL COMMITTEE, JUNE 11, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen other members present.

Awards Recommended:—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.
To Baron B. Schröder, Englefield Green, for Hydrangeas.

Silver-gilt Banksian Medal.

To Messrs. Sutton, Reading, for Primulas and Gloxinias.
To Messrs. Waterer, Sons & Crisp, Twyford, for Irises.

Silver Banksian Medal.

To Messrs. Barr, Taplow, for herbaceous plants.
To Messrs. Bunyard, Maidstone, for Irises.
To Mr. J. Douglas, Great Bookham, for Border Carnations.
To Mr. Gavin Jones, Letchworth, for herbaceous plants.
To Messrs. Kelway, Langport, for herbaceous plants.
To the Orpington Nursery Co., Orpington, for Irises.
To Messrs. Prichard, Christchurch, for Lupins.
To Suffolk Seed Stores, Woodbridge, for herbaceous plants.
To Messrs. Wallace, Tunbridge Wells, for herbaceous plants.
To Mr. G. G. Whitelegg, Chislehurst, for Irises.

Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Baker, Codsall, for herbaceous plants.
To Messrs. Bath, Wisbech, for Irises and Pyrethrums.
To Messrs. Blackmore & Langdon, Bath, for Delphiniums.
To Central Garden Supplies, Kenton, for herbaceous plants.
To Messrs. Clark, Dover, for herbaceous plants.
To Messrs. Dobbie, Edinburgh, for Godetias.
To Messrs. Engelmann, Saffron Walden, for Carnations.

To Messrs. Hewitt, Solihull, for Delphiniums.
 To Messrs. Ladhams, Southampton, for herbaceous plants.
 To Messrs. Low, Enfield, for Carnations, etc.
 To Messrs. May, Chingford, for Hydrangeas.
 To Mr. G. W. Miller, Wisbech, for herbaceous plants.
 To Messrs. Redgrove, Borough Green, for herbaceous plants.
 To Rolvenden Nurseries, Rolvenden, for Statice.
 To Messrs. Sutton, Reading, for Zinnias.
 To Messrs. Wilson & Agar, Reading, for Lupins.

Award of Merit.

To Carnation 'Flambeau' for cutting (votes unanimous), from Mr. J. Douglas, Great Bookham. A reddish-orange border variety with wide petals and good stiff stems. The colour deepens towards the edges of the flowers.

To Polyanthus 'Barrowby Gem' as a hardy garden plant (votes unanimous), from Mrs. MacColl, Harrogate. A very free-flowering bright citron-yellow Polyanthus which blooms over a long period. The award was made after trial at Wisley.

The awards recommended to Alpine Phloxes and Trollius on trial at Wisley were confirmed.

Selected for trial at Wisley.

Iris 'T. W. Thornton,' from F. Bostock, Esq., Northampton.
 Lupin 'Duke of Richmond,' from Mr. G. R. Downer, Chichester.
 Lupin 'Grace Farwell,' from Messrs. Prichard, Christchurch.
 Lupin 'Reason,' from Mr. G. R. Downer, Chichester.
 Pyrethrum 'Red Emperor,' from Mr. H. Robinson, Hinckley.
Salvia Simmondsii, from Mr. H. Simmons, Southgate.

Other Exhibits.

Mrs. G. Aylwin, Plaxtol : Pæony 'L'Esperance.'
 Messrs. Baker, Codsall : Pyrethrum 'Codsall Pink.'
 F. Bostock, Esq., Northampton : Carnation 'Mrs. F. Bostock.'
 Messrs. Clark, Dover : *Papaver orientale* 'George Pott.'
 Miss E. L. Gladstone, Rock Ferry : Viola 'Betty.'
 Major J. F. Harrison, Hitchin : Viola 'Kingswalden Beauty.'
 Messrs. Kelway, Langport : Pyrethrums.
 Mrs. Lawrence, Hemel Hempstead : Geum 'Mrs. J. A. Lawrence.'
 H. Lee, Esq., Wolverhampton : Pyrethrum 'Mrs. Harold Lee.'
 Little Mundon Nurseries, Ware : herbaceous plants.
 Mr. J. H. Pemberton, Havering : Roses.
 Messrs. Redgrove, Borough Green : *Campanula persicifolia* 'Belle of Kent.'
 W. Van de Weyer, Esq., Dorchester : Antirrhinum 'Variegated Flame.'

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, eighteen other members, and Messrs. T. W. TAYLOR and J. COMBER (visitors) present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. Maxwell & Beale, Broadstone, for rock plants.
 To Mr. J. Robinson, New Eltham, for rock plants.
 To Messrs. Waterer, Sons & Crisp, Bagshot, for Rhododendrons.

Banksian Medal.

To Messrs. Rogers, Southampton, for rock plants.
 To Messrs. Russell, Richmond, for rock plants.
 To Messrs. Tucker, Oxford, for rock plants.

Award of Merit.

To *Calceolaria Benthani* as a hardy flowering plant (votes 10 for, 4 against), from Lt.-Col. L. C. R. Messel, Handcross. A hardy perennial of compact growth.

The leaves form a close grey-green basal tuft from which rise numerous 10-inch stalks bearing many small golden-yellow flowers.

To *Calceolaria biflora* as a hardy flowering plant (votes unanimous), from Lt.-Col. Messel. This and the preceding were collected by Mr. H. F. Comber in the Argentine. The broad, dark green leaves are arranged in rosettes. The slender, red-tinted stalks are a foot high and each carries two or more large, round, pale yellow flowers.

To *Chilotrachium rosmarinifolium* as a hardy flowering shrub (votes 8 for, 2 against), from Sir Wm. Lawrence, Bt., Burford. A small glossy-foliaged shrub 1-2 feet high, collected by Comber. Numerous axillary flower-heads are produced near the tips of the young growths and much resemble white Marguerites, about 1 inch in diameter.

To *Cynoglossum nervosum* as a hardy flowering plant (votes unanimous), from Messrs. Ladhams, Southampton. The erect leafy stems are about 2 feet in height, and each carries a large terminal branched cluster of deep blue flowers like glorified Forget-me-nots.

To *Heliophila longifolia* as a half-hardy annual flowering plant (votes unanimous), from T. Hay, Esq., Hyde Park. A most attractive South African species. The stems, bearing linear leaves 2-3 inches long, branch copiously, each producing several slender spikes of bright blue, white-eyed flowers. These are four-petalled, over half an inch across, and rounded in outline.

To *Lathyrus magellanicus* as a hardy flowering plant (votes unanimous), from Lt.-Col. Messel. A perennial Pea of sturdy growth. It produces freely large axillary racemes of flowers. The colour is purple, which varies in shade and tone. Collected by Comber in the Argentine.

To *Lewisia pygmaea* as a hardy flowering plant for rock garden or alpine house (votes unanimous), from the Director, R.H.S. Gardens, Wisley. An uncommon species of great charm. The leaves are clustered, narrow, grey-green and succulent. Just above the foliage are displayed numerous many-petalled white flowers veined with reddish purple and backed by bright red, toothed sepals.

To *Pentstemon procerus* as a hardy flowering plant (votes 12 for, 4 against), from Sir Wm. Lawrence, Bt. An erect grower with rather narrow opposite leaves and spikes of blossom a foot long, composed of axillary clusters of small blue and lavender flowers. A distinct and choice plant of delicate colouring.

To *Pentstemon utahensis* as a hardy flowering plant (votes unanimous), from T. Hay, Esq. A species of strong growth, with tall, leafy, red-tinted stems. The flowers are fairly large, blue, with a suggestion of mauve shading when freshly expanded.

To *Scyphanthus elegans* (syn. *Grammatocarpus volubilis*) as a hardy flowering plant (votes 10 for, 4 against), from Major J. F. Harrison, Kingswalden Bury, Hitchin. A slender twining plant covered with the harsh hairs commonly present in *Loasaceae*. The leaves are small, pinnate, dark green. The quaint yellow flowers are cup-shaped, with spurred petals and nectaries, also spurred, developed from the outer, infertile, whorl of stamens.

To *Stapelia nobilis* as a greenhouse flowering plant (votes unanimous), from E. M. Preston, Esq., Hayes. An unattractive succulent with erect Cactus-like leafless stems and solitary flowers 8 inches across. From the central cavity of the flower the five fleshy perianth-segments spread outwards. They are hairy, and veined with purple on a yellowish ground.

Other Exhibits.

- Messrs. Charlesworth, Haywards Heath : *Pancratium* sp.
 V. Freeman, Esq., Box Hill : *Juniperus stricta glauca*.
 Dame Alice Godman, Horsham : *Digitalis Beaniana*, *Azalea* hybrid.
 Collingwood Ingram, Esq., Benenden : *Gladiolus crispulatus*.
 T. Hay, Esq., Hyde Park : *Calceolaria uniflora*.
 Messrs. Ladhams, Southampton : *Heuchera* 'Mrs. W. J. Bartholomew.'
 Messrs. Langridge, Westerham : rock plants.
 Sir Wm. Lawrence, Bt., Burford : *Hydrangea* 'Domotol.'
 Messrs. Maxwell & Beale, Broadstone : *Oxalis Deppei*.
 Lt.-Col. Messel, Handcross : *Kolkwitzia amabilis*.
 Messrs. Neale, Newhaven : *Saxifraga hypnoides variegata*.
 Mr. P. S. Patrick, Sevenoaks : shrubs.
 Messrs. Rogers, Southampton : rock plants.
 L. de Rothschild, Esq., Exbury : *Spiraea virgata*.
 Mr. S. Sims, Draycott : rock plants.
 Sir Oscar Warburg, Epsom : *Cistus Shanbergii*.
 Mr. G. E. P. Wood, Ashted : rock plants.

FLORAL COMMITTEE, JUNE 25, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen other members present.

Awards Recommended :—

Gold Medal.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums.

Silver-gilt Banksian Medal.

To Messrs. Barr, Taplow, for herbaceous plants.

To Messrs. Carter, Raynes Park, for *Clerodendron fallax*.

To Messrs. Kelway, Langport, for Pæonies.

To Messrs. Ladhams, Southampton, for Pinks and herbaceous plants.

To Rolvenden Nurseries, Rolvenden, for Statice.

Silver Banksian Medal.

To Messrs. Baggesens, Tunbridge Wells, for Pæonies.

To Messrs. Bath, Wisbech, for Delphiniums and Pæonies

To Messrs. Bloom, Oakington, for herbaceous plants.

To Messrs. Bunyard, Maidstone, for Pæonies.

To Lady Emsley Carr (gr. Mr. T. Doe), Walton-on-the-Hill, for Carnations.

To Messrs. Chaplin, Waltham Cross, for Delphiniums and Roses.

To Messrs. Hewitt, Solihull, for Delphiniums and Pæonies.

To Messrs. Kelway, Langport, for Delphiniums.

To Mr. J. H. Pemberton, Havering, for Roses.

To Messrs. Wallace, Tunbridge Wells, for herbaceous plants.

Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Baker, Codsall, for herbaceous plants.

To Messrs. Engelmann, Saffron Walden, for Carnations.

To Mr. Gavin Jones, Letchworth, for herbaceous plants.

To Messrs. S. Low, Enfield, for Carnations.

To Mr. G. W. Miller, Wisbech, for Pæonies.

To Mr. H. Prins, Wisbech, for Pæonies, Irises, etc.

To Messrs. Robinson, New Eltham, for herbaceous plants.

To Messrs. Sutton, Reading, for Godetias, Antirrhinums, etc.

Award of Merit.

To *Lobelia* 'The Marvel' as a pot plant (votes unanimous), from Mr. P. Ladds, Swanley Junction. A very useful pot plant growing about 1 foot high, and bearing deep blue double flowers with very great freedom.

To Rose 'Duchess of Athol' for cutting (votes unanimous), from Messrs. Dobbie, Edinburgh. A very deep orange H.T. variety of good form.

The awards recommended to Perennial Lupins on trial at Wisley were confirmed.

Selected for trial at Wisley.

Antirrhinum 'Sutton's Pale Pink Gem,' from Messrs. Sutton, Reading.

Antirrhinum 'Sutton's Pale Apricot Gem,' from Messrs. Sutton, Reading.

Delphinium 'Blue Gown,' from Messrs. Blackmore & Langdon, Bath.

Delphinium 'Lovely,' from Messrs. Kelway, Langport.

Pæony 'Gilded Splendour,' from Messrs. Kelway, Langport.

Pæony 'Una Howard,' from Messrs. Kelway, Langport.

Other Exhibits.Messrs. Baker, Codsall: *Aster subcoeruleus* 'Peggy.'

Mr. T. Bones, Cheshunt: Lobelias.

Mr. H. A. Brown, South Chingford: Fuchsias.

Messrs. Cheal, Crawley: Dahlias.

Messrs. Clark, Dover: herbaceous plants.

Messrs. Dobbie, Edinburgh: Roses and Balsams.

H. M. Harding, Esq., Carshalton: Pyrethrum.

Messrs. Hayward, Clacton: Dianthus.

Messrs. Hollamby, Groombridge : Campanulas.
 Misses Hopkins, Coulsdon : herbaceous plants.
 C. A. Jardine, Esq., Chiswick : Campanula 'Telham Star.'
 Messrs. Ladhams, Southampton : Pink 'Brightness.'
 Mr. A. Perry, Enfield : Pæony 'Souvenir de Prof. M. Cornu.'
 Messrs. Stark, Fakenham : Sweet Peas and Pinks.
 Messrs. van Leeuwen, Sassenheim : Pæonies.
 Mr. F. C. Willie, South Nutfield : Carnation 'Mrs. William McAlpine.'
 Messrs. Wilson & Agar, Reading : herbaceous plants.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and twenty other members present.

Awards Recommended :—

Silver Banksian Medal.

To Mr. R. C. Notcutt, Woodbridge, for shrubs.
 To Mr. Amos Perry, Enfield, for bulbous plants.
 To Messrs. L. R. Russell, Ltd., Richmond, for rock plants.

Banksian Medal.

To Messrs. Maxwell & Beale, Broadstone, for rock plants.
 To Messrs. Waterer, Sons & Crisp, Bagshot, for shrubs and rock plants.
 To Mr. G. E. P. Wood, Ashted, for shrubs and rock plants.

Award of Merit.

To *Oenothera trichocalyx* as a half-hardy flowering plant (votes unanimous), from T. Hay, Esq., Hyde Park. A most attractive, erect-growing species. The greyish leaves are narrow and toothed. The flowers are very freely produced, white, suffused at the base with pale yellow. It may with success be treated as an annual.

To *Pentstemon comarrhenus* as a hardy flowering plant (votes 8 for, 4 against), from T. Hay, Esq. A useful border plant 3 feet in height. The foliage is somewhat narrow and glaucous. The flowers are about 1 inch long, pale rosy-purple, the colour less intense in the lower part of the corolla.

To *Streptanthera cuprea* as a tender flowering plant for the rock garden and alpine house (votes unanimous), from Mr. Amos Perry, Enfield. A most charming South African member of the Iridaceae. From a diminutive flat spray of foliage arises a short, curved raceme 6 or 8 inches high, bearing a few relatively large flowers 1½ inch wide. The individual flower is similar in form to that of *Tritonia*, in colour warm buff-yellow, with a bright red-purple, dark-edged, central zone.

Other Exhibits.

H. C. Baker, Esq., Almondsbury : *Carpenteria californica* 'Bodnant Seedling.'
 Messrs. Baker, Codsall : *Primula* sp.
 Messrs. Clark, Dover : *Spartium junceum*, Clark's variety.
 R. Cory, Esq., Cardiff : *Salvia officinalis*, pink variety.
 Mr. T. T. Gething, Salisbury : Campanula 'Schaken.'
 T. Hay, Esq., Hyde Park : *Pentstemon sepalulus*.
 J. R. Kerfoot, Esq., Skipton : *Dianthus* seedling.
 Sir Wm. Lawrence, Bt., Burford : *Salvia* sp.
 Lt.-Col. Messel, Handcross : *Alstroemeria Ligtu* var. *angustifolia*, *A. haemantha*, *Hypsela longiflora*.
 Major A. Pam, Broxbourne : *Philadelphus splendens*.
 E. M. Preston, Esq., Hayes : *Rhododendron discolor*.
 Mr. C. H. Taudevin, Willaston : *Primula* hybrids.
 Messrs. Wallace, Tunbridge Wells : *Papaver macrostemon*.
 The Director, R.H.S. Gardens, Wisley : *Philadelphus* 'Girandole.'
 Mrs. Helen Milford, Chedworth : *Delphinium macrocentron*.

ORCHID COMMITTEE.

JANUARY 29, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen other members present.

Awards Recommended :—*Silver Banksian Medal.*

To Messrs. Sanders, St. Albans, for species and hybrids.

To Messrs. McBean, Cooksbridge, Sussex, for various hybrids.

Banksian Medal.

To Lady Hadden, Rossway, Berkhamstead, for *Calanthe* and *Cypripedium* hybrids.

Award of Merit.

To *Odontoglossum* × *mirum aureum* (*crispum* × *Wilckeanum*) (votes 12 for, 1 against), from Messrs. McBean. Spike of thirteen flowers, segments well-developed, bright yellow with a few red-brown markings.

Cultural Commendation.

To Messrs. Sanders, for *Oncidium Cavendishianum*, with a tall and many-flowered spike.

To Mr. R. Cottam, Orchid grower to Gus Mayer, Esq., Wistlers Wood, Woldingham, Surrey, for *Cypripedium* × *Leeanum* var. *Clinkaberryanum*, with about thirty flowers.

Other Exhibits.

Messrs. Stuart Low, Jarvis Brook, Sussex : species and hybrids.

Messrs. Charlesworth, Haywards Heath : the uncommon *Oncidium anthrocrene*, and numerous hybrids.

Mr. Harry Dixon : *Dendrobium aureum* and *Cypripedium* hybrids.

Baron Bruno Schröder, Englefield Green : *Cypripedium* × 'Renown.'

W. J. Burstow, Esq., Haywards Heath : *Cymbidium* × 'Lucastes' of clear yellow colour.

George Eyre, Esq., 23 Bedford Gardens, London : *Catasetum maculatum*.

Mr. John Evans, Colwyn Bay : *Cypripedium* hybrids and *Cymbidiums*.

ORCHID COMMITTEE, FEBRUARY 12, 1929.

F. J. HANBURY, Esq., in the Chair, and thirteen other members present.

Awards Recommended :—*Silver Banksian Medal.*

To S. G. Brown, Esq., Shepperton, Middlesex : for various species.

To Messrs. McBean, Cooksbridge, Sussex, for a group.

To Messrs. Cowan, Southgate, for *Cypripedium* hybrids and *Cymbidiums*.

To Messrs. Sanders, St. Albans, for *Cymbidium* hybrids.

Banksian Medal.

To Messrs. Stuart Low, Jarvis Brook, Sussex, for species and hybrids.

To Mr. John Evans, Colwyn Bay, for *Cypripediums*.

First-class Certificate.

To *Miltonia* × 'Lycaena,' Orchidhurst var. ('Princess Margaret' × 'Lord Lambourne') (votes unanimous), from Baron Bruno Schröder, Englefield Green, Surrey. Flowers of large size; sepals and labellum heavily suffused with red-rose, petals more intensely coloured with ruby-red, base of the lip bearing a brownish mask with ray-like markings on a white ground.

Award of Merit.

To *Odontioda* × 'Matador' (*Odontioda* × 'St. Andre' × *Odontoglossum* × 'Leander') (votes unanimous), from Messrs. Sanders. Spike of eight intense crimson-red flowers.

To *Cymbidium* × 'Vesta' (*Alexanderi* × *insigne*) (votes 6 for), from Messrs. McBean, Cooksbridge, Sussex. Spike of fourteen flowers, pale pink, the labellum spotted with rose-red.

Cultural Commendation.

To Mr. F. W. Thurgood, Orchid grower to S. G. Brown, Esq., Shepperton Middlesex, for *Dendrobium delicatum*, with twenty-three flower-spikes.

Other Exhibits.

Messrs. Black & Flory, Slough: *Cypripediums*.

F. J. Hanbury, Esq., East Grinstead: *Sophrolaeliocattleya* × 'Ursula,' scarlet.

Gus Mayer, Esq., Woldingham: *Cypripedium* × 'Perseus' var. 'Alpha' and the new *Odontoglossum* × 'Vrania.'

ORCHID COMMITTEE, FEBRUARY 26, 1929.

F. J. HANBURY, Esq., in the Chair, and eleven other members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for species and hybrids.

To Messrs. Sanders, St. Albans, for species and hybrids.

Silver Banksian Medal.

To Messrs. Cowan, Southgate, for *Cattleya* and *Cypripedium* hybrids.

To Messrs. McBean, Cooksbridge, Sussex, for hybrids.

To Messrs. Alexander, Tetbury, for *Cymbidiums*.

Banksian Medal.

To Messrs. Stuart Low, Jarvis Brook, Sussex, for a group.

To Mr. John Evans, Colwyn Bay, for *Cypripediums*.

First-class Certificate.

To *Laeliocattleya* × 'Sunbelle,' Brockhurst var. (*L.-c.* × 'Serbia' × *C.* × 'Thora') (votes unanimous), from F. J. Hanbury, Esq., Brockhurst, East Grinstead. A beautiful flower with thick rosy-mauve segments, the labellum yellow in the centre and purple on the front lobe.

To *Cymbidium* × 'Letty,' Wyld Court var. ('Merlin' × *Gottianum*) (votes unanimous), from Sir William Cooke, Bt., Wyld Court, Hampstead Norris, Berks. Spike of six large flowers, white with blush shading, the labellum marked with dark crimson lines and spots.

Award of Merit.

To *Cattleya* × 'Remy Chollet' var. 'President' ('Monarch' × *Trianae*) (votes unanimous), from Messrs. Sanders, St. Albans. The spike bore three rose flowers, the labellum with a large purplish centre and a golden-yellow throat.

To *Cymbidium* × 'Morvyth,' Exbury var. ('Redstart' × *Alexanderi*) (votes unanimous), from Lionel de Rothschild, Esq., Exbury, Southampton. The spike carried nine flowers of a pleasing rose colour with darker venation, and with a marginal area of crimson on the front lobe of the labellum.

To *Odontioda* × 'Acis' var. 'Radiant' ('Royal Gem' × 'Orion') (votes unanimous), from Messrs. Charlesworth, Haywards Heath. Spike of eight well-formed flowers, rich velvety crimson, the lip rose-purple.

To *Odontoglossum* × 'Harold' var. 'Distinction' (*eximium* × 'Jasper') (votes 8 for, 1 against), from Messrs. McBean, Cooksbridge. Spike of ten flowers with broad sepals and petals, almost covered with crimson blotching.

To *Cymbidium* × 'Rosanna' ('Kittiwake' × *Alexanderi*) (votes unanimous), from Messrs. Alexander, Tetbury. Spike of eight well-formed flowers, creamy white, the lip spotted with red.

Other Exhibits.

Robert Paterson, Esq., Ardingly : *Brassocattleya* × 'Pallas.'

S. G. Brown, Esq., Shepperton : *Cymbidium* × 'Erica' var. 'Alicia' of light yellow colour, and *Odontioda* × 'Grenadier' with a spike of fourteen crimson-red flowers.

Gus Mayer, Esq., Woldingham : an *Odontioda* of unknown parentage.

ORCHID COMMITTEE, MARCH 12, 1929.

F. J. HANBURY, Esq., in the Chair, and fourteen other members present.

Awards Recommended :—*Gold Medal.*

To Messrs. Sanders, St. Albans, for a group.

To Messrs. Alexander, Ltd., Tetbury, for *Cymbidiums*.

To Robert Paterson, Esq., Ardingly, Sussex, for a group.

Silver-gilt Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

Silver Banksian Medal.

To S. G. Brown, Esq., Shepperton, for a group.

To Messrs. McBean, Cooksbridge, Sussex, for *Cymbidiums*.

Banksian Medal.

To Messrs. Stuart Low, Jarvis Brook, Sussex, for a group.

To Messrs. Cowan, Southgate, for *Cymbidiums*.

To Mr. John Evans, Colwyn Bay, for a group.

First-class Certificate.

To *Cymbidium* × 'Gold Crest' (parentage unrecorded) (votes 10 for, 1 against), from Sir William Cooke, Bt., Wyld Court, Newbury, Berks. Spike of six large ivory-white flowers, the lip with a few rose markings, the column rose.

Award of Merit.

To *Cymbidium* × 'Ralph Sander,' Old Quarry var. (*Cooperi* × *Pauwelsii*) (votes 11 for), from W. J. Burstow, Esq., Old Quarry, Haywards Heath. Of yellowish ground colour, with much crimson-red shading and lines of similar colour; the labellum large with a crimson zone to the lip.

To *Cymbidium* × 'Pipit' var. 'Mandarin' (*Gottianum* × 'Miranda') (votes 10 for), from Messrs. H. G. Alexander, Ltd., Tetbury, Glos. Spike of seven flowers, yellow with obscure rose tinting on the sepals and petals.

To *Brassolaeliocattleya* × 'Vashti' (*L.-c.* × 'Beatrice' × *B.-c.* × 'Bianca') (votes 11 for), from Messrs. McBean, Cooksbridge, Sussex. A pretty flower with rosy-mauve sepals and petals, and bright purple labellum.

To *Laeliocattleya* × 'Vega' (*L.-c.* × 'Soulange' × *L.-c.* × 'Rubens') (votes 13 for), from Messrs. McBean. A round rosy-mauve flower, the labellum crimson-purple with an orange-yellow throat.

To *Phalaenopsis amabilis* var. *Elisabethae* (votes 13 for), from Messrs. Sanders. The result of crossing *P. amabilis* with the form known as *P. Rimestadiana*. Flowers white and with round petals.

Cultural Commendation.

To Mr. A. Merry, Orchid grower to Robert Paterson, Esq., for *Laeliocattleya* × 'Eunice' *alba*, with twelve flowers.

Other Exhibits.

Mr. Harry Dixon, Wandsworth Common : species and hybrids.

Sir William Cooke, Bt. : *Cymbidium* × 'Macaw' and *C. × Coningsbyanum*.

Mrs. Carl Holmes, Welwyn : *Cattleya* × 'Clotho' var. 'The Node,' bright purple colour.

F. J. Hanbury, Esq. : *Odontioda* × 'The Panther' and *Cymbidium* × 'Baldur.'

ORCHID COMMITTEE, MARCH 26, 1929.

F. J. HANBURY, Esq., in the Chair, and sixteen other members present.

Awards Recommended :—

Gold Medal.

To Sir Jeremiah Colman, Bt., Gatton Park, Surrey, for large exhibit of species and hybrids.

Silver-gilt Banksian Medal.

To Messrs. Sanders, St. Albans, for a group.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

Silver Banksian Medal.

To Messrs. McBean, Cocksbridge, Sussex, for a group.

To Messrs. Stuart Low, Jarvis Brook, Sussex, for species and hybrids.

First-class Certificate.

To *Brassocattleya* × 'Prince Olaf' (C. × 'Prince Shimadzu' × B.-c. × 'Nena') (votes 10 for), from Messrs. Black & Flory, Slough. A well-formed flower with large rosy-mauve petals tipped with purple, labellum well-proportioned, rich purple, throat orange-yellow.

To *Laeliocattleya* × 'Titymoma' (C. × 'Tityus' × L.-c. × 'Momus') (votes 11 for), from Messrs. Cowan, Southgate. An excellent deep rose hybrid, the sepals unusually broad, the round labellum frilled at the margin, rich purple, with golden lines in the throat.

Award of Merit.

To *Cymbidium* × 'Marabou' var. 'Exbury' (*insigne* × 'Vesta') (votes 8 for, 3 against), from Lionel de Rothschild, Esq., Exbury, Southampton. Spike of eleven white flowers, the labellum freckled with light rose.

To *Cymbidium* × 'Plover,' Wyld Court var. (*Lowio-grandiflorum* × *Pauwelsii*) (votes 10 for), from Sir William Cooke, Bt., Hampstead Norris, Berks. Spike of seventeen large flowers, bright yellowish green, the labellum with a crimson zone on the front lobe.

To *Miltunia* × 'Lucia' var. 'Molly Paterson' (*Charlesworthii* × 'Princess Margaret') (votes 12 for), from Robert Paterson, Esq., Ardingly, Sussex. Petals crimson-purple, the labellum flushed with bright purple and having a reddish mask at the base.

To *Miltunia* × 'Nadia' var. 'Helen Paterson' (*vexillaria* × 'Princess Margaret') (votes 11 for, 2 against), from Robert Paterson, Esq. A pleasing hybrid with a spike of five flowers of bright rose colour.

To *Cymbidium* × 'Vesta' var. *sanguinolentum* (*Alexanderi* × *insigne*) (votes 14 for), from Messrs. Stuart Low, Jarvis Brook, Sussex. Sepals and petals blush-white with rose shading, the labellum heavily marked with deep crimson.

To *Odontioda* × 'Velasquez' (parentage unrecorded) (votes 10 for, 3 against), from Gus Mayer, Esq., Woldingham, Surrey. Flowers round, with scarlet-red blotching on a rose ground.

To *Cymbidium* × 'Puffin' var. 'Calypso' ('Dryad' × 'Martin') (votes 10 for, 3 against), from Messrs. H. G. Alexander, Tetbury, Glos. Sepals and petals cream-white, the labellum almost covered with confluent dark crimson spotting.

Other Exhibits.

Mr. John Evans, Colwyn Bay : *Dendrobium* × *Thwaitesiae* and *D. Pierardii*.

Robert Paterson, Esq. : *Brassocattleya* × 'Grand Monarque.'

Messrs. Black & Flory, Slough : various *Cypripediums*.

Mrs. Carl Holmes, Welwyn : *Odontoglossum crispum* var. *Pentonii*.

Messrs. Cowan : *Odontoglossum triumphans* var. 'Lionel Crawshaw,' with a spike of twelve flowers.

F. J. Hanbury, Esq., East Grinstead : *Odontoglossum* × 'Sylvia M. Agges.'

ORCHID COMMITTEE, APRIL 9, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Sanders, St. Albans, for Cymbidiums, etc.
To Messrs. Charlesworth, Haywards Heath, for hybrids.
To Messrs. Cowan, Southgate, for a group.
To Messrs. H. G. Alexander, Tetbury, for a group.

Silver Banksian Medal.

To Messrs. Stuart Low, Jarvis Brook, Sussex, for Dendrobiums, etc.

Banksian Medal.

To Mr. John Evans, Colwyn Bay, for a group.

First-class Certificate.

To *Brassocattleya* × 'Springtide' var. 'The Node' (*B.-c.* × 'Mad. Chas. Maron' × *C. Mossiae*) (votes 10 for, 3 against), from Mrs. Carl Holmes, Welwyn, Herts. A large bright rosy-mauve flower, with the labellum purplish-rose round the margin, the centre old-gold colour.

To *Miltonia* × 'Lucia' var. 'Molly Paterson' (*vexillaria* × 'Princess Margaret') (votes 9 for), from Robert Paterson, Esq., Ardingly, Sussex. This plant received an A.M. at the previous meeting, since when its colour had fully developed.

Award of Merit.

To *Odontioda* × 'Bluebell' (parentage unrecorded) (votes 9 for, 4 against), from Gus Mayer, Esq., Wistlers Wood, Woldingham. Spike of six round flowers, bright purplish-rose with slight violet tinge.

To *Odontioda* × 'Cardinal Mercier' (parentage unrecorded) (votes 12 for, 1 against), from Sir Jeremiah Colman, Bt., Gatton Park, Surrey. Spike of eight flowers, of an uncommon but attractive purplish colour.

To *Sophrolaeliocattleya* × 'Gertrude Jeldels' (*S.-l.-c.* × 'Flamingo' × *S.-l.-c.* × 'His Majesty') (votes 11 for), from Messrs. Charlesworth. Flowers comparatively large, mauve-purple with reddish shading.

To *Ansellia congoensis*, Witley var. (votes 12 for), from J. J. Joicey, Esq., The Hill, Witley, Surrey. The spike bore about sixty flowers, with much richer coloration than usual in the species.

Cultural Commendation.

To Mr. Wm. Penton, Orchid grower to Mrs. Carl Holmes, for *Odontoglossum* × 'Maharajah,' with a spike of twenty-six flowers.

To Mr. J. Mackay, Orchid grower to J. J. Joicey, Esq., for *Megaclinium Bufo*, with a tall inflorescence.

Other Exhibits.

Baron Bruno Schröder, Englefield Green : *Dendrobium* × *plumptonense* var. 'Model,' a very attractive hybrid.

Robt. Paterson, Esq. : *Cymbidium* × *Gottianum* and *Miltonia* × 'H. T. Pitt.'

J. J. Joicey, Esq. : *Cymbidium* × 'Louis Sander,' with a spike of thirteen flowers, and *C.* × *Alexanderi* var. 'Rosy Gem.'

ORCHID COMMITTEE, APRIL 23, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen other members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sanders, St. Albans, for Cymbidiums.

To Messrs. Charlesworth, Haywards Heath, for *Odontoglossum* species and hybrids.

Silver-gilt Banksian Medal.

To Messrs. Sanders, St. Albans, for a group.

To Messrs. McBean, Cooksbridge, Sussex, for *Odontoglossums*.

Silver Banksian Medal.

To Messrs. Stuart Low & Co., Jarvis Brook, Sussex, for a group.

First-class Certificate.

To *Milnionia* × 'William Pitt,' Baron Schröder's var. ('Isabel Sander' × *Bleuana*) (votes 10 for, 4 against), from Baron Bruno Schröder, The Dell Park, Englefield Green, Surrey. Flowers rich velvety crimson, labellum purplish-crimson.

To *Brassocattleya* × 'Springtide,' Stonehurst var. (*B.-c.* × 'Mad. Chas. Maron' × *C. Mossiae*) (votes 13 for, 0 against), from Robert Paterson, Esq., Ardingly, Sussex. Large flowers of rose-purple colour, the labellum with an old-gold centre and a fringed margin.

Award of Merit.

To *Odontioda* × 'Gwentara' (*Odontioda* × 'Alcantara' × *Odontioda* × 'Gwendoline') (votes unanimous), from Messrs. Charlesworth. Flowers of a cardinal-red colour edged with rose-pink.

To *Odontioda* × 'Marie Antoinette' var. 'Excelsa' (*Odontioda* × 'Colinge' × *Odontoglossum* × 'President Poincaré') (votes 8 for, 3 against), from Messrs. Charlesworth. Spike of five flowers, petals unusually large, marked with scarlet-red on a rose ground.

Cultural Commendation.

To Mr. A. Merry, Orchid grower to Robert Paterson, Esq., for *Milnionia Phalaenopsis*.

Other Exhibits.

Messrs. Black & Flory, Slough : *Cattleyas*.

Mr. John Evans, Colwyn Bay : *Cymbidium* × *Devonianum*, with five many-flowered pendulous spikes.

Messrs. Cowan, Southgate : *Coelogyne Mooreana magnifica*.

S. G. Brown, Esq. Shepperton : *Lycaste Skinneri* var. 'Mrs. Sidney Brown.'

ORCHID COMMITTEE, MAY 7, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen other members present.

Awards Recommended :—

Silver Banksian Medal.

To S. G. Brown, Esq., Shepperton-on-Thames, for a group of species.

First-class Certificate.

To *SophrOLAELIocattleya* × 'Yokohama' (*S.-l.-c.* × 'Prince Hirohito' × *C.* × 'Hesperus') (votes 7 for, 1 against), from Baron Bruno Schröder, Englefield Green, Surrey. Flowers of medium size, well-proportioned and of thick texture. Sepals and petals salmon, with rose venation, the labellum ruby-crimson, with golden veins on the central area.

Preliminary Recognition.

To *Milnionia* × 'Memoria H. T. Pitt,' Stonehurst var. ('Princess Mary' × 'Wm. Pitt') (votes unanimous), from Robert Paterson, Esq., Ardingly, Sussex. Flowers deep velvety crimson, labellum with a bright yellow crest area and radiating lines on a lighter ground.

Other Exhibits.

Messrs. Stuart Low, Jarvis Brook, Sussex : species and hybrids.

Messrs. Sanders, St. Albans : well-flowered plants of *Dendrobium thyrsiflorum*.

Robt. Paterson, Esq. : *Milnionia* × *gatonensis* and *Odontoglossum* × 'Naomi.'

Mrs. Carl Holmes, Welwyn : *Milnionia* × 'Lycaena' var. 'The Node.'

Gns Mayer, Esq., Woldingham : *Odontoglossum* × 'Purple Queen.'

Mr. John Evans, Colwyn Bay : *Laeliocattleya* × 'G. S. Ball.'

CHELSEA SHOW : ORCHID COMMITTEE, MAY 22, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen other members present.

[For cups and medals recommended by the Judges, see p. xxxi.]

Awards Recommended :—

First-class Certificate.

To *Cattleya* × 'Prince Shimadzu' var. 'King George' (*C.* × 'Tityus' × *C. Hardyana*) (votes unanimous), from Messrs. Black & Flory, Slough. A beautiful bright rosy-mauve hybrid with the labellum purple on the front lobe and bright yellow in the centre.

To *Phalaenopsis* × 'Gilles Gratiot' ('Aphrodite' × *Rimestadiana*) (votes unanimous), from Messrs. Sanders, St. Albans. Flowers about five inches in diameter, pure white, with large round petals.

To *Odontioda* × 'Prince Olaf' (parentage unknown) (votes 11 for), from Messrs. Sanders. Spike of six comparatively large flowers, rich crimson-red, the labellum lighter at the apex.

To *Miltonia* × 'T. B. Armstrong' (*rexillaria* var. *Leopoldii* × 'Wm. Pitt') (votes 13 for, 1 against), from Messrs. Armstrong & Brown, Tunbridge Wells. A distinct hybrid. Sepals and petals rich magenta-crimson, labellum with a dark maroon blotch at the base.

To *Odontioda* × 'Laura,' Exbury var. (*Brewii* × 'Coronation') (votes 10 for, 4 against), from Lionel de Rothschild, Esq., Exbury, Southampton.

Award of Merit.

To *Lissochilus speciosus* (votes unanimous), from W. R. Lysaght, Esq., Castleford, Chepstow, and by W. J. B. Van de Weyer, Esq., Clyffe, nr. Dorchester. A South African species with tall spikes of flowers in which the petals and labellum are bright yellow.

To *Dendrobium* × 'Prince Arthur' var. 'Colossus' (*regium* × 'Euryalus') (votes 12 for), from Sir Jeremiah Colman, Bt., Gatton Park, Surrey. Large rosy-pink flowers, the labellum with a cream throat.

To *Odontioda* × 'Zarina' var. 'Brilliant' (*Odontioda* × 'Chantecler' × *Odontoglossum* × *crispo-Harryanum*) (votes 11 for, 4 against), from Messrs. Cowan, Southgate. A beautiful hybrid with a spike of seven large flowers of bright orange.

To *Cypripedium bellatulum* var. 'King George V.' (votes 13 for), from Frank T. Paul, Esq., Cloudeeslee, Caldý, Cheshire. A superior form of this well-known species.

To *Brassolaeliocattleya* × 'Gordon Highlander' var. 'Majestic' (*L.-c.* × 'Aphrodite' × *B.-c.* × 'Mad. Chas. Maron') (votes 13 for, 3 against), from Messrs. Stuart Low, Jarvis Brook, Sussex. Flower unusually large, sepals and petals rose, labellum rich purple, crisped at the margin, throat orange-yellow.

To *Laeliocattleya* × 'Berenice' (*L.-c.* × 'Lustre' × *L.-c.* × 'Mme. Brasseur Hye') (votes unanimous), from Messrs. H. G. Alexander, Ltd., Tetbury, Glos. Flowers well-formed, rosy-mauve in the sepals and petals, crimson-purple in the labellum.

To *Brassolaeliocattleya* × 'Orange Glory' (*L.-c.* × 'Elinor' × *B.-c.* × *heatonensis*) (votes unanimous), from Messrs. H. G. Alexander. An attractive bright orange-yellow flower.

To *Odontioda* × 'Leeana' var. 'Vivid' (*C. Noezliana* × *O. crispo-Harryanum*) (votes 13 for), from Messrs. McBean, Cooksbridge, Sussex. Spike of thirteen large flowers of bright scarlet-red.

To *Cattleya* × 'Susan' *alba* ('Suzanne Hye' × *Cowaniana*) (votes unanimous), from Messrs. McBean. Flowers of large size, pure white, except for some yellow in the throat.

To *Brassocattleya* × 'The Globe' var. 'Mrs. Simon Gay' (*B.-c.* × *Cliftonii* × *C. Trianae*) (votes 13 for), from Frank Mercer, Esq., Steyning, Sussex. An elegant flower with round rosy-mauve petals and well-balanced dark purple labellum.

Preliminary Recognition.

To *Miltonia* × *Armstrongii* ('Miss Louisa Fowler' × 'Wm. Pitt') (votes 16 for), from Messrs. Armstrong & Brown. The seedling bore a single flower of reddish-rose colour.

Cultural Commendation.

To Messrs. McBean, for a very fine specimen of *Dendrobium acuminatum*, bearing eighteen spikes with an aggregate of 360 flowers and buds.

To Mr. E. J. May, Orchid grower to J. B. Joel, Esq., Childwick Bury, St. Albans, for a superb specimen of *Cypripedium Rothschildianum* with eight spikes and about forty well-developed flowers.

To Mr. C. V. Kent, Orchid grower to E. R. Ashton, Esq., Broadlands, Tunbridge Wells, for a well-flowered plant of *Dendrobium atrovioleaceum*.

ORCHID COMMITTEE, JUNE 11, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen other members present.

Gold Medal.

To Messrs. Charlesworth, Haywards Heath, for *Odontoglossums*.

Silver-gilt Banksian Medal.

To S. G. Brown, Esq., Shepperton-on-Thames, for a group of species.

Silver Banksian Medal.

To Messrs. Sanders, St. Albans, for species and hybrids.

Award of Merit.

To *Laeliocattleya* × *Hassallii*, Arddarroch var. (*L.-c.* × 'Britannia' × *C. Warszewiczii*) (votes unanimous), from Mrs. Brooman White, Arddarroch, Garelochhead. A large flower with white sepals and petals and wide purple labellum.

Preliminary Recognition.

To *Miltonia* × 'Vida,' Paterson's var. (*Blenana* × 'Wm. Pitt') (votes unanimous), from Robert Paterson, Esq., Ardingly, Sussex. Flower rich crimson-red.

Cultural Commendation.

To Mr. F. W. Thurgood, Orchid grower to Robert Paterson, Esq., for *Epidendrum pentotus* with ten spikes of bloom.

Other Exhibits.

Messrs. Stuart Low, Jarvis Brook, Sussex: various hybrids.

Baron Bruno Schröder, Englefield Green: *Miltonia* × 'Wm. Pitt,' Dell Park var., and *M. vexillaria* var. 'Butterfly.'

Mr. John Evans, Colwyn Bay: *Odontoglossum* × 'Lilian' var. *perfectum* with a spike of thirteen flowers.

C. G. Osborne, Esq., Highfield, Marlow: *Odontoglossum* × 'Lady Ashcombe' var. 'Solita,' white with brownish markings.

ORCHID COMMITTEE, JUNE 25, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twelve other members present.

Awards Recommended:—

Silver Banksian Medal.

To F. J. Hanbury, Esq., Brockhurst, East Grinstead, for species and hybrids.

Bronze Medal.

To Messrs. Black & Flory, Slough, for *Miltonia* hybrids.

Other Exhibits.

Messrs. Cowan, Southgate: *Laeliocattleya* × 'Model' and other hybrids.

Messrs. Stuart Low, Jarvis Brook, Sussex: species and hybrids.

Messrs. Sanders, St. Albans: *Oncidium Lanceanum* and *Lycaste tricolor*.

W. J. Burstow, Esq., Haywards Heath: *Odontioda* × 'Vanessa.'

Frank Mercer, Esq., Steyning, Sussex: *Miltonia vexillaria* with about twenty spikes of bloom.

Gus Mayer, Esq., Woldingham: *Odontioda* × 'Sheila' and other hybrids.

NARCISSUS AND TULIP COMMITTEE.

FEBRUARY 12, 1929.

Mr. GEORGE MONRO, C.B.E. (later Mr. E. A. BOWLES, M.A., F.L.S., V.M.H.),
in the Chair, and nine other members present.

Award Recommended :—

Silver-gilt Banksian Medal.

To Messrs. James Carter & Co., Raynes Park, for Tulips.

(There were no plants submitted for certificate.)

NARCISSUS AND TULIP COMMITTEE, FEBRUARY 26, 1929.

Mr. G. W. LEAK (later Mr. C. H. CURTIS, F.L.S.) in the Chair, and eight
other members present.

Award Recommended :—

Silver Banksian Medal.

To Messrs. R. H. Bath, Wisbech, for Tulips and Daffodils.

(There were no plants submitted for certificate.)

NARCISSUS AND TULIP COMMITTEE, MARCH 12, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and eleven other
members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. R. H. Bath, Wisbech, for Daffodils and Tulips.

Banksian Medal.

To Mr. G. W. Miller, Wisbech, for Daffodils.

(There were no plants submitted for certificate.)

NARCISSUS AND TULIP COMMITTEE, MARCH 26, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and nineteen
other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. J. L. Richardson, Waterford, for Daffodils.

Silver Banksian Medal.

To Messrs. J. R. Pearson, Lowdham, for Daffodils.

To Messrs. Barr, Covent Garden, W.C., for Daffodils.

To Messrs. R. H. Bath, Wisbech, for Tulips.

Banksian Medal.

To Mr. G. W. Miller, Wisbech, for Tulips and Daffodils.

Award of Merit.

To *Narcissus* 'Whiteley Gem' for exhibition (votes 14 for, 0 against). Division II. (a). An *incomparabilis* variety with broad primrose-yellow perianth segments and an apricot-coloured tubular cup of medium length having an orange-coloured crinkled mouth. Raised by the Brodie of Brodie and shown by Mr. R. F. Calvert, Coverack, Cornwall.

Postponement of Daffodil Show.

In view of the lateness of the season it was recommended that the Daffodil Show be postponed for a week and held on April 16 and 17.

NARCISSUS AND TULIP COMMITTEE, APRIL 9, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and nineteen other members present.

Awards Recommended :—

Gold Medal.

To Mr. J. L. Richardson, Waterford, for Daffodils.

Silver-gilt Banksian Medal.

To Mr. F. A. Secrett, Twickenham, for Daffodils.

To Mr. R. F. Calvert, Coverack, Cornwall, for Daffodils.

Silver Banksian Medal.

To Messrs. Barr & Sons, Covent Garden, W.C., for Daffodils.

Award of Merit.

To *Narcissus* 'Golden Ingot' for exhibition (votes 10 for, 3 against). Division II. (a). A large-flowered *incomparabilis* variety with a smooth flat yellow perianth and a frilled cup of medium length and a deeper shade of yellow. Raised and shown by Mr. J. L. Richardson.

To *Narcissus* 'Fanny Currey' for exhibition (votes 10 for, 1 against). Division IV. (a). A *Leedsii* variety with a creamy-white medium-sized cup having an indented margin daintily tinged with apricot. (This variety received a Certificate of Preliminary Recognition as an exhibition flower on April 15, 1925.) Raised and shown by Mr. J. L. Richardson.

Variety Selected for Trial.

Narcissus 'Advance Guard,' shown by Messrs. R. H. Bath, was selected for trial at Wisley as a variety for garden decoration and as a market variety for cutting from the open.

NARCISSUS AND TULIP COMMITTEE, APRIL 16, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and twenty-five other members present.

Awards Recommended :—

Gold Medal.

To Mr. J. L. Richardson, Waterford, for Daffodils.

To The Donard Nursery Company, Newcastle, Co. Down, for Daffodils.

Silver-gilt Banksian Medal.

To Messrs. Barr, Covent Garden, W.C., for Daffodils.

To Mr. R. F. Calvert, Coverack, Cornwall, for Daffodils.

To Mr. F. A. Secrett, Twickenham, for Daffodils.

To Mr. Guy L. Wilson, Broughshane, Co. Antrim, for Daffodils.

Silver Banksian Medal.

To Messrs. Sutton, Reading, for Daffodils.

To The Welsh Bulb Fields, St. Asaph, for Daffodils.

Banksian Medal.

To Mr. H. Longford, Abingdon, for Daffodils.
 To Mr. P. Lower, Malvern Wells, for Daffodils.
 To Messrs. D. Stewart & Son, Wimborne, for Daffodils.

Certificate of Cultural Commendation.

To Mr. Guy L. Wilson for his group of Daffodils.

Award of Merit.

To *Narcissus* 'Beersheba' for cutting (votes 17 for, 0 against). This well-known white trumpet variety, raised by the Rev. G. H. Engleheart, received a First-Class Certificate as an exhibition flower on March 23, 1926. Shown on this occasion by Mr. Guy L. Wilson.

To *Narcissus* 'Solleret' for exhibition (votes 19 for, 0 against). Division VII. A large well-formed golden-yellow Jonquil hybrid, raised by the Rev. G. H. Engleheart and shown by Mr. W. B. Cranfield, Enfield Chase.

To *Narcissus* 'Adventure' for exhibition (votes 18 for, 0 against). Division II. (a). A large-flowered *incomparabilis* variety with a spreading golden-yellow trumpet almost as long as the perianth segments, and broad smooth deep-yellow perianth segments. Raised and shown by Mr. Herbert Chapman, Rye.

To *Narcissus* 'May Molony' for exhibition (votes 16 for, 0 against). Division IV. (a). A refined *Leedsii* variety with smooth broad white perianth segments and a clear lemon-yellow cup of medium length. Raised and shown by Mr. Guy L. Wilson.

Variety to be seen again.

The Committee desired to see *Narcissus* 'Riva,' shown by Mr. Guy L. Wilson, on some future occasion.

Variety Selected for Trial.

Narcissus 'Edgar Thurston,' shown by Mr. F. A. Secrett, was selected for trial at Wisley as a market variety for cutting from the open.

The Peter Barr Memorial Cup.

It was unanimously recommended that the Peter Barr Memorial Cup, which is awarded annually to someone who has done good work on Daffodils, be awarded to Mr. G. W. Leak for his work in raising new daffodils.

NARCISSUS AND TULIP COMMITTEE, APRIL 23, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and fourteen other members present.

Awards Recommended :—*Gold Medal.*

To Messrs. Sutton, Reading, for Tulips.

Silver-gilt Banksian Medal.

To Messrs. R. H. Bath, Wisbech, for Daffodils.
 To Messrs. Barr, Covent Garden, W.C., for Daffodils.
 To Messrs. J. R. Pearson & Sons, Lowdham, for Daffodils.

Silver Banksian Medal.

To Messrs. Herbert Chapman, Rye, for Daffodils.

Banksian Medal.

To Mr. J. W. Barr, Wimborne, for Daffodils.
 To Messrs. D. Stewart & Sons, Wimborne, for Daffodils and Tulips.

Award of Merit.

To *Narcissus* 'Sunstar' for exhibition (votes 12 for, 0 against). Division III. (b). A well-formed bicolor *Barrii* variety with broad creamy-white perianth segments of good texture, and a flattened frilled orange-red orange-centred cup. Raised by Mrs. R. O. Backhouse and shown by Mr. J. C. Richardson, Waterford.

NARCISSUS AND TULIP COMMITTEE, MAY 7, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and fifteen other members present.

Awards Recommended :—

Gold Medal.

To Messrs. Barr & Son, Covent Garden, W.C., for Daffodils.

Silver-gilt Banksian Medal.

To Messrs. Herbert Chapman, Rye, for Daffodils.

To Mr. F. A. Secrett, Twickenham, for Daffodils.

Silver Banksian Medal.

To Messrs. R. H. Bath, Wisbech, for Daffodils.

Banksian Medals

To Messrs. Cartwright & Goodwin, Kidderminster, for Daffodils.

To Messrs. D. Stewart & Son, Wimborne, for Daffodils and Tulips.

Award of Merit.

To *Narcissus* 'Recessional' for exhibition (votes unanimous). Division IX. A *poeticus* variety with broad pure white perianth segments and a yellow-centred crown which has a frilled orange margin. Raised and shown by Mr. F. H. Chapman.

To *Narcissus* 'Bridgroom' for exhibition (votes unanimous). Division III. (b). A well-formed bicolor *Barrii* variety with flowers of good substance borne on long stout stems. The perianth segments are creamy-white, while the cup is yellow edged with orange. Raised by the Brodie of Brodie and shown by Mr. R. F. Calvert, Coverack, Cornwall.

To *Narcissus* 'Brimstone' for exhibition (votes 9 for, 1 against). Division I. (a). A trumpet variety of good substance. The perianth segments and the trumpet are of a sulphur-yellow, the latter having a recurved margin. Raised by the Rev. G. H. Engleheart and shown by Mr. W. B. Cranfield, Enfield Chase.

To *Narcissus* 'Huon' for cutting (votes 11 for, 0 against). Division IX. A good-quality *poeticus* variety. The cup has a yellow centre and a reddish-orange margin. Raised by the Rev. G. H. Engleheart and shown by Mr. F. A. Secrett.

Award Confirmed.

On April 22, 1924, *Narcissus* 'Daphne' received a First-Class Certificate, but the purpose for which the variety was considered suitable was not specified. It was now recommended that the award be entered as having been given in view of the variety's suitability for cutting. Shown by Seymour Cobley, Ltd.

Varieties Selected for Trial.

The following varieties were selected for trial at Wisley :

Narcissus 'Daphne' for garden and market.

Narcissus 'Huon' for market.

NARCISSUS AND TULIP COMMITTEE, MAY 21, 1929.

Mr. W. B. CRANFIELD, F.L.S., in the Chair, and thirteen other members present.

Awards Recommended :—

Award of Merit.

To Tulip 'Dorothy Ann' for exhibition and cutting (votes 9 for, 0 against). A well-formed English Tulip, red with white base. Raised and shown by Sir Daniel Hall, Merton.

To Tulip 'Clos de Vougeot' for cutting and garden decoration (votes 11 for, 0 against). A deep crimson Tulip raised by crossing a Darwin and an English Tulip. Raised and shown by Sir Daniel Hall.

To Tulip 'Lady Ernle' for exhibition (votes 10 for, 0 against). An orange-scarlet variety raised by crossing an Early Tulip with an English variety. Raised and shown by Sir Daniel Hall.

To *Narcissus* 'Finality' for cutting (votes 11 for, 0 against). Division IX. A *poeticus* variety of medium size with slightly reflexed perianth segments and a yellow-centred red-edged cup. Raised by the Rev. G. H. Engleheart and shown by Mr. F. A. Secrett, Twickenham.

To *Narcissus* 'May Glory' for exhibition (votes 8 for, 2 against). Division IX. A well-formed *poeticus* variety with broad flat perianth segments and an orange-red cup. Raised by the Rev. G. H. Engleheart and shown by Mr. F. A. Secrett.

To *Narcissus* 'Triplex' for exhibition (votes 11 for, 0 against). Division X. A pure white semi-double *poeticus* variety with six full-sized perianth segments and a ring of smaller ones in place of a cup. Raised by Mr. F. H. Chapman and shown by Herbert Chapman, Ltd.

To *Narcissus* 'Khatmandu' for exhibition (votes 6 for, 1 against). Division IV. (b). A dainty *Leedsii* variety with a flattened frilled white crown which is tinged with green in the centre. Raised by Mr. F. H. Chapman and shown by Herbert Chapman, Ltd.

BOOKS AND PAMPHLETS PRESENTED, PURCHASED, OR
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1929, AND DEPOSITED IN THE LIBRARY.

- 1 = Presented by the Publisher.
2 = Purchased.
3 = Sent for Review.
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EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

AMATEURS' FLOWER SHOW.

JULY 9, 1929.

Chief Awards.

Silver Cup, for the highest points in Division A.

To Lionel de Rothschild, Esq., Exbury House, Southampton.

Silver Cup, for the highest points in Division B.

To J. H. Junkin, Esq., Ravenswold, Kenley, Surrey.

Silver Cup, for the highest points in Division C.

To C. Luckin, Esq., Wadlands, East Grinstead.

A lecture on "Roses: The Modern Standard," was given by Mr. G. W. Taylor.

Chairman, Mr. T. Hay, M.V.O., V.M.H.

DEPUTATION TO NORWICH.

JULY 11, 1929.

A deputation, consisting of Messrs. E. A. Bowles, W. Cuthbertson, T. Hay, and G. W. Leak, with the Assistant Secretary, visited the Norfolk and Norwich Horticultural Society's Centenary Show at Norwich, and made the following awards:—

Gold Medal.

To Messrs. A. J. & C. Allen, Norwich, for Roses.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.

Silver-gilt Flora Medal.

To Messrs. R. H. Bath, Wisbech, for Delphiniums and other herbaceous plants.

To Messrs. Daniels Brothers, Norwich, for a mixed group of Gladioli, Roses, Sweet Peas, etc.

To Messrs. A. Reeves, Norwich, for Roses.

Silver-gilt Banksian Medal.

To Messrs. Hewitt, Solihull, for Delphiniums.

To Messrs. J. Peed, West Norwood, for stove and greenhouse plants.

Silver Flora Medal.

To Hon. Arnold Henderson, Writtle Park, Chelmsford (gr. Mr. E. H. Starling), for Sweet Peas.

To Messrs. Stark, Fakenham, Norfolk, for Poppies and other hardy flowers.

Silver Banksian Medal.

To J. A. Christie, Esq., M.P., The Manor House, Framlingham (gr. Mr. High), for hardy shrubs.

To Baroness Cederström, Haveringland Hall, Norwich (gr. Mr. F. Tweed), for annuals and biennials.

To Samuel Wallrock, Esq., The Manor House, Stanmore (gr. Mr. W. H. Holloway), for Sweet Peas.

To Messrs. Isaac House, Bristol, for Scabious and other herbaceous plants.

To Messrs. Lowe & Gibson, Crawley Down, for Border Carnations.

To Mr. G. W. Miller, Wisbech, for a group of herbaceous plants and Roses.

Silver Veitch Memorial Medal and £5.

To G. L. Lang, Esq., Great Plumstead Hall, Norwich (gr. Mr. F. Sheldrake), for Delphiniums.

Bronze Veitch Memorial Medal and £2 10s.

To Gordon Winter, Esq., Wramplingham, for Seedling Pinks.

CLAY CHALLENGE CUP COMPETITION.

JULY 16, 1929.

The Clay Challenge Cup, for a new Rose possessing the true, old-rose scent, was awarded to Messrs. B. R. Cant, Colchester, for Rose 'Aroma.'

CULINARY PEA COMPETITION.

Chief Awards.

Class 1.—Six distinct varieties of Peas.

First Prize, £3.

To Samuel Wallrock, Esq., The Manor House, Stanmore (gr. Mr. W. H. Holloway).

Class 2.—Three distinct varieties of Peas.

First Prize, £1 10s.

To R. Chetwynd Stapylton, Esq., Headlands, Berkhamstead (gr. Mr. W. Meager).

A lecture was given by Mr. W. B. Cranfield on "British Ferns and Their Varieties."

Chairman, Dr. F. W. Stansfield, F.L.S.

JULY 30, 1929.

A lecture was given by Mr. T. A. Barnes on "The Flora of the Equatorial Highlands of Africa."

Chairman, Mr. W. Hales, A.L.S.

DEPUTATION TO DUBLIN.

AUGUST 7, 1929.

A deputation, consisting of Mr. R. Cory, F.L.S., Hon. H. D. McLaren, C.B.E., J.P., and Mr. Mark Fenwick, J.P., visited the Show of the Royal Horticultural Society of Ireland, at Dublin, and made the following awards:—

Gold Medal.

To Messrs. Alex. Dickson, Newtownards, for a group of Roses.

To Hon. A. E. Guinness, Chapelizod, co. Down, for foliage and flowering plants.

To The Donard Nursery Co., co. Down, for flowering plants.

To Messrs. Sutton, Reading, for vegetables.

Silver-gilt Flora Medal.

- To Messrs. W. Drummond, Dublin, for herbaceous plants and rock garden.
 To Messrs. S. McGredy, Portadown, for Roses.
 To Mrs. Stephenson, Donnybrook, Dublin, for Gladioli.
 To Mr. George Watson, Dublin, for Gladioli.

Silver-gilt Banksian Medal.

- To Messrs. Allwood Brothers, Haywards Heath, for Carnations.
 To Mr. James Dugan, Carlow, for Gladioli and Phlox.
 To Mrs. West, Bray, co. Wicklow (gr. Mr. Coster), for Gladioli.

Silver Flora Medal.

- To Mrs. Brittain, Kilcronan (gr. Mr. Crossan), for foliage and flowering plants.
 To Messrs. Carter, Raynes Park, for Gladioli.

Silver Knightian Medal.

- To Hon. A. E. Guinness, Chapelizod, for vegetables.

Silver Banksian Medal.

- To The Dublin Nursery Co., Dublin, for a group of cut flowers.
 To Messrs. Sir J. W. Mackay, Dublin, for a group of cut flowers.
 To Capt. Lewis Riall, D.L., Bray, co. Wicklow (gr. Mr. Webster), for hardy cut flowers.
 To Mrs. Toner, Monaghan, N. Ireland, for Begonias.
 To Messrs. W. Watson, Killiney, co. Dublin, for group of shrubs and fruit trees.
 To Mrs. West, Bray, co. Wicklow (gr. Mr. Coster), for Sweet Peas.

Flora Medal.

- To C. Wisdom Hely, Esq., Rathgar, co. Dublin (gr. Mr. Orr), for collection of annuals.

Hogg Medal.

- To Mrs. Gubbins, Knocklong, co. Limerick (gr. Mr. McCann), for Grapes.

Banksian Medal.

- To Lord Ardee, Bray, co. Wicklow (gr. Mr. Barrett), for Sweet Peas.
 To The Burton Nurseries, co. Kildare, for rock plants and heaths.
 To Mr. James Allen, Kilkenny, for group of cut flowers.
 To Capt. French, Booterstown Av., Dublin, for Scabious and Gladioli.
 To Canon H. Kingsmill-Moore, D.D., Dundrum, co. Dublin, for ferns.
 To D. Pack-Beresford, Esq., D.L., Bagenalstown (gr. Mr. Colvin), for hardy cut flowers.

FOREMARKE CHALLENGE CUP COMPETITION.

AUGUST 13, 1929.

The Foremarke Challenge Cup, for twenty spikes of named Gladioli in not less than ten varieties, was awarded to Mr. W. E. Phillips, 52 Clarence Road, Wood Green.

A lecture was given by Mr. Amos Perry on "Aquatic and Water-side Plants." Chairman, Mr. C. T. Musgrave, V.M.H.

AUTUMN SHOW.

Chiefly for Open-air Plants and Roses.

SEPTEMBER 19-20, 1929.

Awards.

Wigan Cup, for the best exhibit of Roses staged on an area not exceeding 100 sq. ft.
 To Mr. T. Robinson, Nottingham.

Gold Medal.

- To Messrs. R. H. Bath, Wisbech, for Gladioli.
- To Messrs. Blackmore & Langdon, Bath, for Begonias.
- To Messrs. Alex. Dickson, Newtownards, for Roses.
- To Messrs. Dobbie, Edinburgh, for Dahlias.
- To Mr. J. B. Riding, Chingford, for Dahlias.
- To Mr. T. Robinson, Nottingham, for Roses.

Silver Cup.

- To Messrs. S. McGredy, Portadown, for Roses.

Silver-gilt Lindley Medal.

- To Hon. Mrs. Montagu, Attleboro' (gr. Mr. J. E. Fitt), for Montbretias.

Silver-gilt Flora Medal.

- To Messrs. Dickson & Robinson, Manchester, for Dahlias.
- To Mr. J. W. Forsyth, Putteridge, for early-flowering Chrysanthemums.
- To Mr. H. J. Jones, Lewisham, for Dahlias.
- To Messrs. Keith Luxford, Sawbridgeworth, for early-flowering Chrysanthemums.
- To Mr. Amos Perry, Enfield, for aquatic and water-side plants.
- To Mr. G. Prince, Longworth, for Roses.
- To Messrs. W. Treseder, Cardiff, for Dahlias.

Silver-gilt Banksian Medal.

- To Mr. T. Bones, Cheshunt, for Michaelmas Daisies.
- To Messrs. Chaplin, Waltham Cross, for Roses.
- To Messrs. Jarman, Slough, for Dahlias.
- To The King's Acre Nurseries, Hereford, for Dahlias.
- To Messrs. M. Prichard, Christchurch, for herbaceous plants.
- To Messrs. J. Stredwick, St. Leonards, for Dahlias.
- To Messrs. R. Wallace, Ltd., Tunbridge Wells, for Lilies and other herbaceous plants.
- To Mr. W. Wells, Jun., Merstham, for Michaelmas Daisies and other herbaceous plants.
- To Mr. H. Woolman, Birmingham, for Dahlias and early-flowering Chrysanthemums.

Silver Flora Medal.

- To Messrs. Barr, Covent Garden, for Montbretias, Michaelmas Daisies, and other herbaceous plants.
- To Messrs. Ben. R. Cant & Sons, Colchester, for Roses.
- To Messrs. Carter Page, Ltd., London Wall, for Dahlias.
- To Messrs. Dowtys Rosery, Wokingham, for Roses.
- To Mr. Gavin Jones, Letchworth, for herbaceous plants.
- To Messrs. B. Ladhams, Southampton, for Lobelias and other herbaceous plants.
- To Mr. J. H. Pemberton, Romford, for Roses.
- To Messrs. M. Prichard, Christchurch, for rock-garden plants.
- To Messrs. D. Prior, Colchester, for Roses.
- To Messrs. L. R. Russell, Richmond, for water and rock-garden plants.
- To Mr. J. T. West, Brentwood, for Dahlias.

Silver Banksian Medal.

- To Mr. J. C. Allgrove, Slough, for Roses.
- To Messrs. Allwood, Haywards Heath, for Pinks and Border Carnations.
- To Messrs. Bakers, Codsall, for herbaceous plants.
- To Mr. E. Ballard, Malvern, for Michaelmas Daisies.
- To Messrs. G. Bunyard, Maidstone, for Asters and other herbaceous plants.
- To Messrs. J. Cheal, Crawley, for Dahlias.
- To Messrs. W. Easlea, Leigh-on-Sea, for Roses.
- To Mr. Clarence Elliott, Stevenage, for rock-garden plants and dwarf Conifers.
- To Messrs. E. F. Fairbairn, Carlisle, for Phloxes.
- To Messrs. J. Forbes, Hawick, for Phloxes, Pentstemons, and Dahlias.
- To The Gayborder Nurseries, Melbourne, for Michaelmas Daisies.
- To Messrs. Harkness, Bedale, for herbaceous plants and Gladioli.
- To Messrs. R. Harkness, Hitchin, for Roses.
- To Mr. H. Hemsley, Crawley, for Dahlias and hardy flowers.

- To Messrs. Hewitt, Ltd., Solihull, for Roses.
- To Messrs. Hewitt, Ltd., Solihull, for Delphiniums.
- To Mr. Elisha J. Hicks, Twyford, for Roses.
- To Messrs. Isaac House, Bristol, for Scabious and Tritomas.
- To Mr. W. E. T. Ingwersen, E. Grinstead, for rock-garden plants and dwarf conifers.
- To Messrs. G. Jackman, Woking, for herbaceous plants.
- To Mr. James MacDonald, Harpenden, for grass garden.
- To Messrs. Maxwell & Beale, Broadstone, for rock-garden plants.
- To Messrs. Oliver & Hunter, Moniaive, for herbaceous plants, bulbous and rock-garden plants.
- To Messrs. Rich & Cooling, Bath, for herbaceous plants.
- To Messrs. T. Smith, Stranraer, for Roses.
- To Stanway Rose Gardens, Colchester, for Roses.
- To Miss S. S. Thompson, Handsworth, for Cacti.
- To Messrs. Warner, Boxted, for Roses.
- To Messrs. Wheatcroft, Gedling, for Roses.
- To Messrs. Wm. Wood, Taplow, for herbaceous plants.

Flora Medal.

- To Messrs. A. J. and C. Allen, Norwich, for Roses.
- To Mr. R. J. Case, Taunton, for herbaceous plants.
- To Mr. A. Miles, Bromley, for herbaceous plants.
- To Messrs. W. H. Rogers, Southampton, for rock-garden plants and shrubs.
- To Mr. G. E. Welch, Cambridge, for rock-garden plants.

Banksian Medal.

- To Backhouse Nurseries, York, for rock-garden shrubs and plants.
- To Messrs. Clark, Dover, for herbaceous plants.
- To Mr. H. Clarke, Taunton, for Dahlias.
- To Messrs. W. Cutbush, Barnet, for Michaelmas Daisies and Dahlias.
- To Mr. P. Gardner, Addingham, for rock-garden plants.
- To Messrs. G. Gibson, Bedale, for rock-garden plants and dwarf shrubs.
- To Mr. S. J. Goodliffe, Bishop's Stortford, for Dahlias and herbaceous plants.
- To Messrs. Hillier, Winchester, for water and rock-garden plants.
- To Messrs. W. Keep, Enfield, for herbaceous plants.
- To King's Acre Nurseries, Hereford, for early-flowering Chrysanthemums.
- To Little Munden Nursery, Ware, for herbaceous plants and Dahlias.
- To Orpington Nursery Co., Orpington, for Gladioli.
- To Mr. Amos Perry, Enfield, for herbaceous and bulbous plants.
- To Messrs. E. J. Redgrove, Borough Green, for herbaceous plants and Gladioli.
- To Mr. G. Reuthe, Keston, for herbaceous and rock-garden plants.
- To Mr. F. Rich, Worcester, for herbaceous plants.
- To Messrs. J. Robinson, New Eltham, for rock-garden and hardy plants.
- To Messrs. W. H. Simpson, Birmingham, for Antirrhinums and Montbretias.
- To Messrs. Tuckers, Ltd., Oxford, for herbaceous and rock-garden plants.
- To Mr. Charles Turner, Slough, for Dahlias.
- To Mr. G. E. P. Wood, Ashted, for rock-garden plants.
- To Mr. Wm. Yandell, Maidenhead, for Dahlias.

A lecture was given by Mr. F. E. Garnett, on behalf of the British Association of Refrigeration, on "The Cold Storage of Fruit, Flowers, and Vegetables" (see p. 64).

Chairman, Mr. E. M. Bear.

AUTUMN SHOW.

Chiefly for Ornamental Trees and Shrubs.

OCTOBER 2-3, 1929.

Gold Medal.

- To Mr. G. Reuthe, Keston, for shrubs.

Silver-gilt Flora Medal.

- To Messrs. J. Cheal, Crawley, for trees and shrubs.

Silver-gilt Banksian Medal.

- To Messrs. Alex. Dickson, Newtownards, for Roses.
- To Messrs. Maxwell & Beale, Broadstone, for heaths.
- To Mr. R. C. Notcutt, Woodbridge, for trees and shrubs.
- To Messrs. D. Prior, Colchester, for Roses.
- To Mr. J. B. Riding, Chingford, for Dahlias.
- To Messrs. R. Wallace, Tunbridge Wells, for trees and shrubs.

Silver Flora Medal.

- To Mr. T. Bones, Cheshunt, for Michaelmas Daisies.
- To Messrs. Ben. R. Cant, Colchester, for Roses.
- To Messrs. Dobbie, Edinburgh, for Gladioli.
- To The Donard Nursery Co., co. Down, for shrubs.
- To Messrs. Fletcher, Chertsey, for conifers and shrubs.
- To The Gayborder Nurseries, Melbourne, for Michaelmas Daisies.
- To Messrs. Robert Green, London, for Bay and Box trees.
- To Messrs. Hillier, Winchester, for trees and shrubs.
- To Messrs. G. Jackman, Woking, for Clematis.
- To Messrs. Jarman, Slough, for Dahlias.
- To Messrs. B. Ladhams, Southampton, for shrubs and herbaceous plants.
- To Messrs. L. R. Russell, Richmond, for Clematis and other shrubs.
- To Mr. T. Smith, Newry, Ireland, for trees and shrubs.
- To Messrs. D. Stewart, Wimborne, for trees, shrubs, and Conifers.
- To Messrs. Sanders, St. Albans, for Orchids.
- To Messrs. R. Veitch, Exeter, for trees and shrubs.
- To Messrs. J. Waterer, Sons & Crisp, Twyford, for trees and shrubs.
- To Mr. W. Wells, Jun., Merstham, for Michaelmas Daisies.
- To Messrs. Wm. Wood, Taplow, for trees and shrubs.

Silver Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations and Pinks.
- To Messrs. Bakers, Codsall, for shrubs and Conifers.
- To Mr. E. Ballard, Malvern, for Michaelmas Daisies.
- To Messrs. R. H. Bath, Wisbech, for Gladioli.
- To Messrs. W. Blom, London, for Colchicums.
- To Messrs. G. Bunyard, Maidstone, for Conifers and other trees and shrubs.
- To Messrs. A. Charlton, Rotherfield, for trees and shrubs.
- To Mr. J. W. Forsyth, Putteridge, for early-flowering Chrysanthemums.
- To Mr. S. J. Goodliffe, Bishop's Stortford, for herbaceous plants and shrubs.
- To Messrs. Harrods, London, for Box and Bay trees.
- To Mr. H. Hemsley, Crawley, for trees and shrubs.
- To Messrs. Hillier, Winchester, for Conifers.
- To Messrs. Hollambys Nurseries, Groombridge, for ornamental vines and shrubs.
- To Messrs. Isaac House, Bristol, for Scabious and Tritomas.
- To Messrs. Stuart Low, Enfield, for Carnations.
- To Messrs. Stuart Low, Enfield, for Orchids.
- To Messrs. Keith Luxford, Sawbridgeworth, for early-flowering Chrysanthemums.
- To Mr. J. H. Pemberton, Romford, for Roses.
- To Messrs. E. J. Redgrove, Borough Green, for herbaceous plants.
- To Messrs. J. Robinson, New Eltham, for rock-garden and herbaceous plants.
- To Messrs. Wm. Wood, Taplow, for Michaelmas Daisies.

Flora Medal.

- To Mr. W. J. Marchant, Wimborne, for trees and shrubs.
- To Messrs. J. Scott, Somerset, for shrubs and conifers.

Banksian Medal.

- To Messrs. G. & A. Clark, Dover, for herbaceous plants.
- To Messrs. G. & A. Clark, Dover, for trees and shrubs.
- To Messrs. W. Cutbush, Barnet, for shrubs.
- To Messrs. E. F. Fairbairn, Carlisle, for Phloxes.
- To Mr. J. Golding, Fordham, for Scabious.
- To Mr. H. Hemsley, Crawley, for rock-garden plants.
- To Mr. Gavin Jones, Letchworth, for herbaceous plants and shrubs.
- To Mr. John Klinkert, Richmond, for clipped Box trees.

To Messrs. H. Langridge, Westerham, for Dahlias.
 To Messrs. Stuart Low, Enfield, for Conifers and shrubs.
 To Messrs. Patricks, Sevenoaks, for Conifers and shrubs.
 To Mr. Amos Perry, Enfield, for hardy plants.
 To Mr. F. Rich, Worcester, for Michaelmas Daisies.
 To Messrs. Rich & Cooling, Bath, for herbaceous plants.
 To Mr. Charles Turner, Slough, for Dahlias.
 To Mr. Wm. Yandell, Maidenhead, for early-flowering Chrysanthemums.

EXHIBITS OF FRUIT.

Gold Medal.

To Mr. J. C. Allgrove, Slough, for fruit trees and gathered fruit.

Silver-gilt Hogg Medal.

To Messrs. G. Bunyard & Co., Ltd., Maidstone, for gathered fruit.

Silver Hogg Medal.

To Messrs. Laxton Bros., Bedford, for fruit trees and gathered fruit.

FRUIT AND VEGETABLE SHOW.

OCTOBER 8, 1929.

CHIEF AWARDS.

Fruit.

The Gordon-Lennox Cup, for the most meritorious display of fruit staged by an Amateur.

To Major C. Drummond, Cadland Park, Southampton (gr. Mr. L. A. Smith).

The George Monro Memorial Cup, for the best exhibit of Grapes staged by an Amateur.

To Lord Hotham, Dalton Holme, Beverley, E. Yorks (gr. Mr. J. S. Coates).

The Affiliated Societies' Challenge Cup, which was offered for award for the best exhibit of fruit staged by an Affiliated Society, was awarded to the Pangbourne and District Gardeners' Mutual Improvement Association.

Class 1.—Amateurs. Collection of nine dishes of ripe dessert fruit.

First Prize, Silver Hogg Medal and £9.

To the Duke of Newcastle, Clumber, Worksop (gr. Mr. S. Barker).

Class 2.—Amateurs. Collection of six dishes of ripe dessert fruit.

First Prize, Silver Hogg Medal and £6.

To Viscount Hambleden, Henley-on-Thames (gr. Mr. W. Turnham).

Class 3.—Amateurs. Collection of eight bunches of Grapes.

First Prize, Silver Hogg Medal and £15.

To Lord Hotham, Dalton Holme, Beverley (gr. Mr. J. S. Coates).

Class 4.—Amateurs. Collection of four bunches of Grapes.

First Prize, Silver Hogg Medal and £6.

To Viscount Hambleden, Henley-on-Thames (gr. Mr. W. Turnham).

Class 14.—Amateurs. Collection of thirty dishes of hardy fruits.

First Prize, Silver Hogg Medal and £15.

To Major C. Drummond, Cadland Park, Southampton (gr. Mr. L. A. Smith).

Class 15.—Amateurs. Collection of twelve dishes of hardy fruits.

First Prize, Silver Hogg Medal and £6.

To Sir Randolph Baker, Ranston, Blandford (gr. Mr. A. E. Usher).

Class 16.—Amateurs. Collection of twenty-four dishes of Apples.

First Prize, Fruiterers' Company's Silver-gilt Medal and £10.

To Major C. Drummond, Cadland Park, Southampton (gr. Mr. L. A. Smith).

Class 17.—Amateurs. Collection of twelve dishes of Apples.

First Prize, Fruiterers' Company's Silver Medal and £5.

To Sir Randolph Baker, Ranston, Blandford (gr. Mr. A. E. Usher).

Class 20.—Amateurs. Collection of eighteen dishes of dessert Pears.

First Prize, Silver-gilt Hogg Medal and £10.

To Col. Wingfield Digby, Sherborne Castle, Dorset (gr. Mr. E. Hill).

Class 123.—Market Growers. Four British standard boxes of Cox's Orange Pippin.

First Prize, Silver Hogg Medal and £5.

To Mr. H. J. Russell, Hatfield Peverel, Essex.

Class 124.—Market Growers. Four British standard boxes of dessert Apples.

First Prize, Silver Hogg Medal and £5.

To Reading University, Reading.

Class 125.—Market Growers. Four British standard boxes of Bramley's Seedling.

First Prize, Silver Hogg Medal and £5.

To Messrs. W. Brice & Sons, Higham, Kent.

Class 126.—Market Growers. Four British standard boxes of cooking Apples

First Prize, Silver Hogg Medal and £5.

To Messrs. W. Brice & Sons, Higham, Kent.

Class 127.—Market Growers. Three boxes of Cox's Orange Pippin.

First Prize, Hogg Medal and £3.

To Mr. H. G. Evans, Hatfield Peverel, Essex.

Class 128.—Market Growers. Three boxes of dessert Apples.

First Prize, Hogg Medal and £3.

To Mr. Glover Long, Lower Higham, Kent.

Class 129.—Market Growers. Three boxes of Conference Pears.

First Prize, Hogg Medal and £3.

To Messrs. F. & T. Neame, Faversham.

Class 130.—Market Growers. Three boxes of Doyenne du Comice Pears.

First Prize, Hogg Medal and £3.

To Messrs. F. & T. Neame, Faversham.

Vegetables.

The R.H.S. Challenge Cup, for the highest aggregate number of points.

To Viscount Hambleden, Henley-on-Thames (gr. Mr. W. Turnham).

The Sutton Cup, for a collection of twelve kinds of vegetables.

To Viscount Hambleden, Henley-on-Thames (gr. Mr. W. Turnham).

Silver Cup, for a table of vegetables.

To Viscount Hambleden, Henley-on-Thames (gr. Mr. W. Turnham).

Class 203.—Amateurs. Collection of nine kinds of vegetables.

First Prize, Silver-gilt Knightian Medal and £5.

To Sir D. Watson, Groombridge (gr. Mr. R. MacDonald).

ORCHID SHOW.

OCTOBER 23, 1929.

Competitive Awards.

The Schröder Challenge Cup, for the best exhibit of Orchids staged by an amateur.

To F. J. Hanbury, Esq., Brockhurst, East Grinstead (gr. Mr. S. Farnes).

The Orchid Challenge Cup, for the best exhibit of Orchids staged by an amateur in a space not exceeding 60 sq. feet.

To Robert Paterson, Esq., Ardingley, Sussex (gr. Mr. A. Merry).

Orchid Trophy, for the best exhibit of twelve Orchids staged by an amateur.

To Gus Mayer, Esq., Whistlers Wood, Woldingham (gr. Mr. W. Cottam).

A lecture was given by Mr. H. G. Alexander, V.M.H., on "Orchid Growing for Beginners" (see p. 72).

Chairman, Mr. C. H. Curtis, F.L.S.

IMPERIAL FRUIT SHOW.

OCTOBER 25 TO NOVEMBER 2, 1929.

Awards made at the Imperial Fruit Show held at Bingley Hall, Birmingham.

Gold Medal.

To Mr. C. B. Shepherd, Stourmouth, Canterbury, for the best four boxes or trays of Cox's Orange Pippin in the United Kingdom Section.

To Reading University, Reading, for the best four boxes of Worcester Pearmain in the United Kingdom Section.

SEWELL MEDAL COMPETITION.

NOVEMBER 5, 1929.

A Sewell Medal was offered for award for the best exhibit of six pots or pans of plants suitable for the rock-garden or alpine house staged by an amateur, and a similar medal for an exhibit from an horticultural trader.

The Amateurs' Medal.

To G. P. Baker, Esq., Oakhill Road, Sevenoaks.

The Horticultural Traders' Medal.

No exhibit was staged by an horticultural trader.

AWARDS MADE TO EXHIBITS OF PAINTINGS.

Grenfell Medal.

To Hon. Mrs. R. Boyle, Pulborough, Sussex, for paintings of gardens.

To Miss W. M. A. Brooke, 48 Anerley Park, S.E., for insect drawings and flower paintings.

To Winifred Walker, 28 Rivercourt Road, W. 6, for paintings of plants native to North America.

The first Masters Memorial Lecture on "The Relationship between Scion and Rootstock, with special reference to the Tree Fruits," was given by Mr. R. G. Hatton, M.A., Director of the East Malling Research Station (see p. 169).

Chairman, Mr. C. G. A. Nix, V.M.H.

AWARDS MADE TO EXHIBITS OF PAINTINGS.

NOVEMBER 19, 1929.

Silver-gilt Grenfell Medal.

To Sir Herbert Maxwell, Bt., Monreith, Whauphill, Wigtownshire, for paintings of flowers.

Silver Grenfell Medal.

To Miss Reeve Fowkes, The Manor House, Old Town, Eastbourne, for paintings of flowers.

Grenfell Medal.

To Mr. L. Perugini, 11 Market Street, Rye, Sussex, for flower drawings.

To Miss E. Savory, Sandgates, Chertsey, for paintings of flowers.

WALNUT COMPETITION.

A Walnut Competition was held at the Fortnightly Show on November 19, 1929. The object of the Competition is explained in the following extract from the Schedule :—

"The majority of walnut trees in this country are seedlings and, consequently, they vary considerably, for each seedling is a distinct variety. The nuts borne by many compare unfavourably with imported nuts and, as a result, the bulk of the nuts consumed in this country are brought from abroad. This state of affairs is likely to continue until such time as good varieties adapted to our climate are found, propagated by grafting, and grown commercially on an extensive scale.

"The object of this competition is to discover good varieties. And when they are found it is proposed that shoots from which scions can be made should be sent to the East Malling Research Station, East Malling, Kent, and there grafted for distribution. Therefore, one of the conditions of the competition is, that successful competitors shall (if desired) supply twelve shoots from each prize-winning tree from which scions for grafting can be made. Each competitor who sends scions will, in due course, receive two of the young trees obtained from his scions, and the remainder of the young trees, if they prove satisfactory, will be used for the further propagation of the variety.

"The scheme has the cordial approval of the Ministry of Agriculture, which has provided part of the money for the prizes, and Mr. Howard Spence, a recognized authority upon walnuts, has very kindly undertaken to carry out the preliminary examination of the nuts sent for competition and to assist in the final judging.

"Anyone who has one or more walnut trees may have a variety worthy of extended cultivation, and, therefore, all who grow walnuts, whether they are Fellows of the Society or not, are invited to compete and thus assist the Society in its search."

The Schedule contained two classes.

Class 1.—Fresh Nuts. Three pounds of walnuts gathered from one tree, to be judged in the condition in which they are received, that is—as undried nuts.

First Prize, £3 ; Second Prize, £2 ; Third Prize, £1 10s.

Class 2.—Dried Nuts. Three pounds of walnuts gathered from one tree, to be judged after being dried for a fortnight by the Society.

First Prize, Silver Cup (presented by Mr. Howard Spence) and £6 ; Second Prize, £4 10s. ; Third Prize, £3.

The Competition created a great deal of interest throughout the country, there being 287 exhibits in Class 1 and 197 in Class 2.

The judges were Messrs. A. Brown, W. B. Shearn, and Howard Spence.

Prizes were awarded as follows :—

Class 1.—Fresh Nuts.

First Prize. Mr. E. M. Randell, Ixworth, Suffolk, for Entry No. 162.

Second Prize. Mr. J. Plowman, Coldcroft Farm, Huntley, Glos., for Entry No. 95.

Third Prize. Mr. F. Boulton, Manor Farm, Isham, Kettering, for Entry No. 250.

Special Prize of £3 to Mr. C. B. Cowles, Bay Tree House, Stutton, Ipswich, for Entry No. 202.

REPORT OF THE 126TH ANNUAL GENERAL MEETING. lxxxvii

Class 2.—Dried Nuts.

First Prize. Mr. J. Plowman, Coldcroft Farm, Huntley, Glos., for Entry No. 582.

Second Prize. Mr. A. W. Wraight, Graveney Bridge, Faversham, for Entry No. 715.

Third Prize. Mr. J. W. Sowman, Rosebank, Coast Road, West Mersea, for Entry No. 641.

Special Prize of £6 to Mr. C. B. Cowles, Bay Tree House, Stutton, Ipswich, for Entry No. 665.

The East Malling Research Station, East Malling, Kent, sent a very interesting and instructive exhibit illustrating the propagation of walnuts, for which the Council awarded a Silver-gilt Lindley Medal.

M. Louis Trévy, Trevoux, France, was awarded a Gold Medal for a very comprehensive exhibit of the fruits of various varieties and species of Juglans and allied genera and examples of grafted walnut trees.

Messrs. W. B. Shearns, Tottenham Court Road, London, showed examples of good varieties of Californian and other walnuts, and the California Walnut Growers' Association sent examples illustrating the way in which their best nuts are graded and branded.

A lecture on "Walnuts" was given by Mr. Howard Spence (see p. 244).

Chairman, Mr. H. V. Taylor, O.B.E., B.Sc., Commissioner of Horticulture at the Ministry of Agriculture.

AWARDS MADE TO EXHIBITS OF PAINTINGS.

DECEMBER 10, 1929.

Silver-gilt Grenfell Medal.

To Mr. Frank Galsworthy, Chertsey, for paintings of gardens, Irises and other garden flowers.

To Winifred Walker, 28 Rivercourt Road, W. 6, for paintings of plants native to North America.

Silver Grenfell Medal.

To Mr. E. A. Bowles, Myddelton House, Waltham Cross, for flower paintings.

The second Masters Memorial Lecture on "The Relationship between Scion and Rootstock, with special reference to the Tree Fruits," was given by Mr. R. G. Hatton, M.A., Director of the East Malling Research Station (see p. 185).

Chairman, Mr. E. A. Bunyard, F.L.S.

REPORT of the 126th ANNUAL GENERAL MEETING, held on Tuesday, February 25, 1930, in the Lecture Room, New Hall, Greycoat Street, Westminster.

Mr. G. W. E. LODER, F.L.S. (President), in the Chair, supported by the Members of Council and some two hundred Fellows.

The Secretary read the notice convening the Meeting.

The Secretary announced that the Minutes of the last meeting had been circulated in JOURNAL, Vol. 55, Part 1, January 1930.

The Minutes were confirmed by the meeting and signed by the Chairman.

The CHAIRMAN: Ladies and Gentlemen,—A year ago, in submitting the Report of the Council, I began by an allusion to the anxiety the Nation was undergoing, owing to the illness of the Sovereign. Let us begin to-day by an expression of relief and thankfulness that the restoration to health for which we prayed is complete, and that the normal activities of that precious life are gradually being resumed.

That illness deprived us of the presence of their Majesties at the Chelsea Show, but the occasion was graced by the attendance of Princess Mary, who

once more favoured our Society and showed how keen an interest she takes in horticulture.

The Report of the Council, which I now have the pleasure of presenting, is, I think you will admit, comprehensive, not to say exhaustive. Realizing that the bulk of the Fellows are unable to attend the Annual Meeting, the Council endeavours to place them in full possession of its activities, and of the progress of the Society's work during the past year.

It follows, therefore, that little fresh remains to be said, but custom ordains that the President should briefly touch on the more important matters.

Any survey of the year 1929, however superficial, can hardly avoid allusion to that everlasting and ever-engrossing subject to gardeners—the weather. After a harsh and cruel spring, came a late but brilliant summer, to be followed by a trying drought, and in the autumn by torrential rain and devastating storms. There have been years in which we have experienced more severe frosts, greater heat, more prolonged droughts, and heavier rainfall, but never one which presented us with so varied a combination of the vagaries of the British climate as any man living can remember, or ever hopes to experience again.

It might have been expected that these trials would have had a prejudicial effect on vegetation, and to some extent no doubt they had, but there were compensations for our troubles. The patience and industry of gardeners reaped their reward; the flowering of plants and shrubs has seldom been more profuse, the production of fruit and berries more abundant, or the colouring of the foliage more brilliant. The effect was reflected in our Shows which cannot be said to have fallen below the standard of excellence of former years. Judged by the number of applications for space, and by the attendance both at Chelsea—which was a record—and at the Fortnightly Shows, it is manifest that a still unquenchable thirst for horticulture prevails.

The net increase in the number of Fellows is over 850, and many fresh Societies have been affiliated.

The New Hall has amply justified itself by the extra space and additional comfort and convenience afforded, and we are already deriving a very fair return on our lettings. Fellows will be doing the Society good service by bringing the advantages, both of the New Hall and of the remodelled conveniences of the Old Hall, to the notice of the public.

I am fortunate in being able to entrust the statement on the financial affairs of the Society to the capable hands of our Treasurer, Mr. Trotter. I should, however, be failing in my duty if I did not seize this opportunity of thanking him, in your presence, for the untiring zeal and financial ability he has displayed, week in and week out, throughout his first year of office.

In Mr. Trotter we have discovered, if he will forgive me for using the image, a most interesting hybrid, a cross between Lombard Street and Leith Hill, producing precisely the combination between finance and flowers which we require. After a year's experience of him as Treasurer, I really cannot tell you whether the finance or the flowers constitute the dominant character. He displays a skill and knowledge in both, with a modesty and charm which any Chancellor of the Exchequer might well emulate.

With the valuable assistance of Mr. Harper, and our late Treasurer, Mr. Musgrave, the form of accounts has been thoroughly overhauled and remodelled, and I am confident that when you have heard the Treasurer's statement you will have no reason to doubt the soundness of our position, in spite of the strain to which it has been put owing to the heavy expenditure of the last two or three years.

The alterations to the Old Hall and Offices in Vincent Square are approaching completion. During the progress of the work the Staff have been subjected to considerable inconvenience and discomfort, and have had to carry on amidst an almost insufferable accompaniment of din, dust, and dirt. We hope that by Easter everything will be completed and the much needed accommodation available.

Throughout the operations Major Binnie, our Architect, has shown the keenest desire to meet the wishes of the Council in every detail, and his personal supervision has been much appreciated.

As I am on Vincent Square, I am led to say a few words about our Library, which is soon to assume new premises, and our literature. Time was when they were treated rather as the Cinderellas of the Society. That is all changed now.

It is recognized to-day that a good Library is an indispensable equipment of a Society like ours. We are conscious that horticultural works are being drained away, like other good things, by our wealthy cousins across the Atlantic; but thanks to the vigilance of the Library Committee, so ably presided over by

Mr. Bunyard, who I much regret to say is kept away this afternoon by a serious illness, our shelves are gradually being enriched by works useful, and indeed necessary, to horticulturists, and I commend our recently published Catalogue to your notice.

Our own publications, extending over a century and a quarter, contain a vast amount of useful information which threatens to become submerged and hidden away by its own bulk, and we are compiling an Index, extending back to 1840, which will make it accessible.

The usefulness of a Library is greatly enhanced by such works of reference. It is, therefore, with justifiable pride that the Fellows of the Royal Horticultural Society will have welcomed the publication during the past year of the first two volumes of that monumental work now known as the *Index Londinensis*, a catalogue as complete as research can make it, of all drawings and pictures of plants and flowers which have been published in horticultural literature up to 1920. Originally undertaken as a revision of Pritzel's Index by the Society, with funds derived from the International Exhibition of 1912, its publication has, after nearly twenty years of labour under the able editorship of Dr. Otto Stapf, been entrusted to the Oxford University Press. The Society is greatly indebted to the Director of Kew and his staff, for I need hardly say that without their co-operation this work could never have been undertaken, much less carried through, in the manner it has been.

As regards our JOURNAL, it may interest you to know that, although Fellows now have to apply for it, no fewer than 19,000 avail themselves of this privilege, an eloquent proof that it is appreciated.

The experiment of holding the Autumn Show in four sections produced a bewildering diversity of opinion. Experts, as is their wont, differed, thereby once more illustrating the unenviable responsibility which must ultimately rest upon an executive body, however, at the moment, it may happen to be composed. Taking all considerations into account, too diverse to enumerate this afternoon, it has been thought prudent to continue the experiment for another year, feeling that one year is scarcely a sufficient experience for testing the solution of what is undoubtedly a complicated problem. Meanwhile, avenues are being explored in all directions for alternative solutions.

The most interesting and most novel of the subsidiary shows last year was the Walnut Competition, held in co-operation with the Ministry of Agriculture. No fewer than 500 dishes were exhibited, and we are greatly indebted to the Ministry of Agriculture for their co-operation in this matter, and especially to Mr. Howard Spence, who was indefatigable in promoting the success of the Exhibition.

The Report sets forth at length the details of the trials, investigations, and educational work carried on at Wisley during the year, and I need not repeat them now. Frosts during the early part of the year, common fires in the summer, and gales in the winter, inflicted some damage, but on the whole we escaped better than might have been expected.

The Society has now been in possession of Wisley Gardens for twenty-five years, and it is gratifying to be able to report that the number of visitors last year amounted to 48,000, including many organized parties from schools, societies, and institutions.

As you are aware, an important event in the history of the Royal Horticultural Society, and indeed in the history of horticulture, will take place in August.

As I informed you last year, at the invitation of our Society, the Ninth International Horticultural Congress will be held in London, from August 7 to 15. From the preliminary notices already circulated, you will have seen that a comprehensive programme of Lectures has been arranged, as well as numerous excursions. A special Show is being organized for August, which will take the form of Collective Exhibits of flowers and plants. The Council desire to express their thanks to the firms who have come forward to co-operate. His Majesty's Government will give a reception on August 8, and the Society will entertain the principal delegates at dinner on August 11. Arrangements are well advanced, and we hope that as many Fellows as possible will support, and become members of, the Congress, and also take part in its proceedings.

This is the first occasion on which a Horticultural Congress has been held in London, and you may rest assured that every effort will be made to ensure its success.

It has long been felt that some means should exist whereby the services of gardeners, and others professionally connected with horticulture, could be specially recognized. They are, of course, eligible, and will continue to be eligible for the V.M.H., but that distinction is rather restricted in numbers for the wide range of merit over which it has to be distributed. It may be

interesting to members to know that in the thirty-three years since the Victoria Medal of Honour was instituted, there have been almost one hundred vacancies, which gives an average, as you will observe, of about three a year, not a very large number.

The proposal, which I am sure you will all have read with interest, and of which I feel equally sure you will all approve with pleasure, is to institute a new order of members, who will be known as "Associates of Honour." They will be presented with a diploma and a badge, and they will be entitled to practically all the privileges of Fellows, if they are not already Fellows, except the right to vote at meetings, without subscription. The number is never to exceed one hundred, and if this proposal is confirmed to-day, the Council ask for power to elect the first thirty Associates of Honour this year, and announce their names at the time of the Chelsea Show. Thereafter they will be elected by the Council, and the diplomas and badges presented at the Annual Meeting. I shall, later on, move the approval of the new Bye-laws necessary to carry out this proposal.

The question of a memorial to our late President, Lord Lambourne, has been the subject of prolonged deliberation, and every proposal which reached us was carefully examined. It was finally determined that a Portrait Medallion should be placed in the New Hall, the erection of which may be regarded as the culminating achievement of his Presidency. The work has been entrusted to an eminent sculptor, Mr. Reid Dick, R.A., and, judging from the model which has been inspected, it promises to be a highly successful work of art, and a modest but dignified memorial of the man whom we all loved so well. It will be placed in the centre of the wall at the back of the dais.

You will observe that many prominent Fellows have passed away since last year, amongst them Mr. Charles Pearson and Mr. Peter Veitch, the latter belonging to an eminent family of horticulturists. Amongst the foreign members who have passed away, the most prominent is Professor Wittmack, who took so great a part in the Conference on Genetics, which was held under the auspices of the Society a few years ago.

It is no mere formality to offer our thanks to the retiring members of Council.

Lt.-Col. Stephenson Clarke has not only contributed his great knowledge of business and great knowledge of flowers, shrubs, and Orchids, but we have also profited by the many generous gifts he has made, for which the Society is greatly indebted to him.

Mr. Hay, with the unique position he occupies and his remarkably wide experience of men, books, and plants, has been an invaluable colleague. The debt of the Royal Horticultural Society to him is not less than that which the public owes him for what he has done for our Parks and Gardens.

Mr. Leak has most worthily, but by no means exclusively, represented the views of the trade. He has worked hard and conscientiously on the Council and on several Committees. I am certain I am expressing the feelings of my Council when I say that they could wish for no more charming colleague to work with.

In their stead there have been nominated :

Mr. Charles Nix, whose valued services to the Society have extended over many years, and are too well known to you to need recapitulation ;

Mr. George Monro, a prominent and influential figure in many different spheres of horticulture and public life, who has also served on the Council before with distinction ; and

Sir Daniel Hall, who combines the experience of a practical gardener with a very distinguished record in the public service. He is now the Director of the John Innes Institution at Merton, his work on Tulips is well known to you, and we shall consider ourselves fortunate in having secured the benefit of his advice.

Before I conclude, I must offer the acknowledgments of the Council and of the Fellows of the Society to the Judges and members of Committees and generous donors of various gifts and prizes, all set forth at length in the Report ; also to the Press for the valuable assistance they have afforded us in carrying out our work.

I believe it is sometimes thought that we are thick-skinned and obstinate, and a little impervious to criticism. Such qualities are not infrequently attributed to governing bodies in other spheres of life. I can assure you such is not the case. We receive all criticisms and comments in the same spirit as that which we believe animates those who offer them, namely, the welfare of the Society and of horticulture. All suggestions are examined, weighed, discussed with scrupulous care and impartiality, and to the best of our judgment adopted wherever possible. More than that mortal man cannot do.

Lastly, you must allow me to offer, on behalf of the whole body of Fellows, but more especially on behalf of the Council, their thanks to the Staff for the loyal and efficient manner in which they have discharged their duties. No organization could be better served, nor could the relations between the Council and those who serve it be more cordial than those which exist at Vincent Square. I beg Colonel Durham and all those who work with him to accept our thanks, and the assurance of our warm appreciation of their labours.

I beg formally to move the adoption of the Report, and will ask our Treasurer to make a statement with regard to the financial affairs of the Society.

Mr. R. D. TROTTER (Treasurer): Ladies and Gentlemen,—From time to time the Council has received requests from Fellows that the figures given in the Annual Report should be simplified, and arranged so that Fellows of the Society need not enter into elaborate calculations in order to understand them. Accounts which go into minute detail of every receipt and expenditure seldom show the whole position as clearly as those where various kinds of receipts and expenditure are grouped under suitable headings.

It is with this object in view that the Council, after careful consideration, have put forward the figures for the year 1929, grouped in the way you now have them before you.

On this occasion it will not be easy for Fellows to follow the changes from the previous form of the Accounts, and I therefore propose to give you the corresponding figure for the year 1928, for the main items in the accounts. I have here a copy of the Accounts for 1928, made out by our Auditor, Mr. Harper, on exactly the same lines as those now before you for 1929, and if any Fellow desires to see this after the meeting, I shall be very pleased to show it to him.

Taking the figures of the Revenue and Expenditure Account:

"Establishment Expenses." We have allocated a fair proportion of overhead expenses in London to the items under the heading of Hall Lettings, Restaurant, and the Chelsea Spring Meeting, hence the figure before you, £12,638, is lower by £1,900 than that of £14,535 last year.

The cost of the Wisley Gardens, £12,400, is now incorporated in the outgoings of the Society, instead of as heretofore being shown as an isolated item in the Accounts.

I will deal with this in more detail later on.

You will see there is a simplification of such items as printing and postage of the JOURNAL and Meetings.

We show the net receipts of Chelsea Show after allowing £500 for overhead expenses, salaries, etc. The attendance and takings at Chelsea last year were a record for the Society.

The amount expended on Cups and Medals is £450 higher this time, owing to the cost of our new Gold Medal design being more expensive than the old one. A large number of those awarded gold medals during the year have asked to have one of the new design.

During the past year the Society has published the first two volumes of the *Index Londinensis*, which accounts for the increased expenditure under this heading as against the preparatory clerical work hitherto.

As regards the *Botanical Magazine*, which was formerly shown as a Profit and Loss Account, it has been considered that a fairer estimate of the position is to show the actual net outlay each year, and leave the value of the volumes and plates on hand at a nominal figure of £100.

Depreciation and Sinking Fund for the New Hall.—The Council's policy is to provide for the replacement of money invested in the New Hall by means of a Sinking Fund in sixty years' time, and it is proposed to follow the same policy for the Old Hall. I now come to the Restaurant, to which, as already mentioned, a share of establishment charges has been allocated, which in this case accounts for £930 out of a total of £1,743 shown in the Accounts. The figure covers a period of twelve months' working, as against three and a half months last time. The previous figures included the initial expenses, and now include two months' working in the Old Hall also. It is hoped that Fellows will make greater use of the facilities afforded them in the Restaurant than has been the case up to now. The working of the Restaurant during our own Shows accounts for the loss shown in our figures, whereas when the Hall is let the Restaurant is worked at a profit. It should be remembered that the Restaurant is primarily intended for the advantage and convenience of Fellows, who at present make little use of it for lunch, at which hour it is generally far less crowded than at tea-time.

Turning to the Receipt side of the Accounts, Annual Subscriptions are up by

£1,400, which is an indication that membership continues to grow, in spite of the large number lost each year by deaths and resignations.

Dividends represent income from our various Funds only, as all other investments are now represented by the New Hall.

Hall Lettings cover a period of twelve months on the New Hall, as against three and a half months, and include actual rent received from Exhibitions and Bazaars £6,100, and from Dances and Meetings nearly £1,200. Against this total we have charged £1,350 for the share of overhead charges, the balance being actual wages.

Turning to the Society's Balance Sheet, the item "Capital Funds Account" formerly included the capital value of Life Fellows' compositions; it is now proposed to show these two items separately. "Capital Funds" now shows the actual amount of subscriptions collected for the purpose of building the Old Hall and offices.

"Sundry Creditors," as shown, practically explains itself; "Open Accounts" includes an item of £3,500 due to the Builders for the Old Hall, and for work on the JOURNAL. The item "Westminster Bank" is an overdraft of £3,500 which we obtained from our bankers for a few weeks at the end of last year.

"New Hall Sinking Fund" appears as a new item on the Balance Sheet, as I have already mentioned.

"General Reserve Fund" is an amalgamation of the two items "General Reserve Fund" and "General Revenue Account." It is considered that these figures, being now represented on the other side of the Balance Sheet by the asset of the New Hall, show the position more clearly when placed under the one heading, which now amounts to £176,188 after adding £14,220, this sum being the excess of Revenue over Expenditure during the year.

Against this on the Assets side, you will notice the item "Capital Expenditure £227,000" is split into two headings for the Old and New Halls.

At the last Balance Sheet the amount spent on the New Hall stood at £145,000, which included £18,700 for the Restaurant and its plant and equipment. During the year we have spent a further sum of £18,200 for Contractors', Architects', and Surveyors' Fees, £950 for furniture and fittings, and £2,400 for the purchase of cutlery, crockery, etc., in the Restaurant. This brings the total cost of the New Hall to £167,000, as since the date of the Balance Sheet we have paid the last bill of about £400.

As regards the Old Hall, the cost at December 1928 stood at £44,540.

In order to comply with the regulations of the London County Council, we were obliged to make various alterations in our old premises. The Library, too, was very much overcrowded, and, after careful consideration, the present plan was agreed upon. It is hoped during the next few months, when the work is completed, that we shall have thoroughly up-to-date, though not extravagant, premises. Towards this expenditure we have paid £15,800 during the year, and our contract entails a further payment of £9,000 to complete; more than half of that has since been paid.

The value of our freehold property at Wisley remains unchanged at £13,158, and other items call for no comment. In the Wisley expenditure figures, we have endeavoured to re-group the figures under three headings, "Establishment Expenses," "Garden and Estate," and "Laboratory and Research Work." It is difficult to allocate exactly the salaries and labour between these three departments, but it is hoped that in future a new system of analysed accounts, which has been started this year, will give all the necessary information.

The work of plant distribution at Wisley has grown considerably, and now accounts for much of the Staff's time during the next two months. Salaries and wages account for all but £2,000 of the sum contributed to the upkeep of the garden from the general revenue of the Society.

In the Wisley Balance Sheet, capital funds include amounts set aside by the Society out of past revenue, and this item is now represented by the assets: Laboratory, Dwelling Houses, Glass Houses, etc.

Finally, you will observe that we have this year collected all the Trust Fund Accounts into one page of information, showing more clearly the details of the various funds with their capital and income. Below this is a series of notes explaining the origin and purpose of each Fund.

I have gone into the details of our figures at some length, and must apologize for taking so long, but from time to time we have been told in letters, and in the Garden Press, that our Accounts did not give much information to the average Fellow. It is hoped that by the rearrangement, which I have endeavoured to explain in detail, any Fellow who is interested in such matters will have no difficulty in obtaining all the information he requires.

The whole of our expenditure has been met out of our own resources, and

I am sure you will agree that our two Halls represent a very valuable and useful asset to the Society.

It will be our policy, as soon as the alterations to the Old Hall are complete, to commence accumulating Reserve Funds once more out of surplus revenue, to replace those which were realized to pay for our buildings. The Society continues to show a steady annual expansion, and the increasing love of gardening throughout the country augurs well for such in the future.

I beg to second the adoption of the Report.

Mr. BRUNT (Ilford): With reference to "Investments," which seems to be in the form of the New Hall, I want to refer to a special item of investment, that of £6,000 in the Moscow Corporation. It was made, I think, in 1912. I know for many years that investment yielded no interest at all, and I would like to know, as there is no reference to it nowadays, whether it has been wiped off as a bad debt?

Sir WILLIAM LAWRENCE: I must congratulate the Treasurer on the very able statement he has made, but I must personally confess the present form of accounts makes it very difficult indeed for me to find the information which I am interested in.

When I had the honour of being Treasurer of the Society, I was all for giving Fellows as much information as possible in the Accounts, and I think different views are taken occasionally by the Auditors, but, however, we did try to get more information given. The Accounts before us now are not very clear on many matters, and especially the item with regard to the Restaurant.

We are told that there is a loss on the Restaurant on Show days, but the Restaurant pays on other days.

Another matter which was also mentioned by the last speaker: we have had no explanation why there is no longer a list of the investments of the Society.

Another item which I am sorry to see is no longer given, is the amount spent on trees and shrubs at Wisley. There has been so much criticism of Wisley: I should like to say that I do not associate myself at all with the criticism of Wisley; I have the highest respect and the highest regard for the Director, Mr. Chittenden, and I think the way he has for many years carried on these gardens reflects the greatest possible credit on the Society.

Then the Society publishes a large number of exceedingly interesting publications, and I think most of us would like to know how far a profit is made on the publications which are sold, as distinguished from the publications which are circulated to all Fellows.

We also cannot ascertain from these accounts whether the *Botanical Magazine* is progressing, and at what rate it is progressing. This is one of the publications which is a very great credit to the Society.

These are all small matters, but everyone looks at the Accounts for certain things in which they are interested, and if they are all grouped together under one heading, one feels a little bit disappointed at not finding the things in which they are specially interested.

When I approached some of my friends on the Council with certain suggestions, they said "We support them heartily." There was a proposal that there should be a second Amateur Show in the autumn in the Old Hall, but it was said we cannot afford it. When it was suggested that a more worthy memorial should be made to Lord Lambourne, I was also told the Society regretted they could not afford anything more expensive.

These are matters of general interest to the Fellows, who, after all, provide the money, and I think they would like to know a little more about how it is spent.

Mr. ELLIS: I have noted three questions.

My first question has relation to the memory of our late President, and it is this: Have the Council considered the provision of a suitable memorial in connexion with the Wisley Gardens?

My next question has relation to the JOURNAL, and it is this: Will the Council consider the question of restricting the JOURNAL to literary contributions, and transfer what I may call the commercial literature to the Book of Arrangements?

I should be glad if it could be stated in this gathering what is the precise object of the proposed Associates of Honour, and in what relation Associates of Honour will stand to the group of Honorary Members now existing.

The CHAIRMAN: I will reply to the questions which have been put, leaving those dealing with finance to my colleague.

Sir William Lawrence asked what profit there was on the publications. We make no profit on the publications, or practically none.

The *Botanical Magazine*, as I think Sir William must remember, has had a very hard struggle to keep up to time, because the editor is the same as he who is editing the *Index Londinensis*. The Fellows may know that it was absolutely necessary to carry out our agreement with the Oxford University Press with regard to the *Index Londinensis*, and the consequence was that Dr. Stapf's labours for the *Botanical Magazine* were considerably delayed. We are hoping to accelerate the publication of the *Botanical Magazine*; that is the explanation why there has not been the acceleration we hoped for during the last year or two.

With regard to the Second Amateur Show, the suggestion has been made, but at the present moment we do not see our way to adopting it. As I said a few minutes ago, no proposals are turned down without a good deal of consideration. I shall be very glad to go into the matter again with the Council.

I think I can answer the two questions about the Lambourne Memorial together. It certainly was considered whether some building at Wisley could not be erected which would form a suitable memorial to the late Lord Lambourne, but inasmuch as the Society had involved itself in very heavy expenditure in building the New Hall, and in re-modelling the Offices in the Old Hall, it was not thought possible to build anything there that would be of sufficient importance and of sufficient value to the Society, with the money that could be spared at the present time. Moreover, a good many people thought that Lord Lambourne himself would not have cared for a memorial which involved a very large expenditure of money. It was therefore decided that the memorial should take a more modest form. The present moment was not considered opportune for erecting another large building at Wisley.

Then Mr. Ellis's other suggestion was about restricting the matter in the JOURNAL. The Publications Committee take a great deal of trouble over the JOURNAL. I think that suggestion has been made before, but from all the accounts which we receive, the JOURNAL in its present form is exceedingly popular. It must be remembered that the JOURNAL is to a very large number of Fellows the only source of information they have of the results of all the trials, and the prizes and the investigations which go on. We have found on the whole, although a good many people share Mr. Ellis's views, that the form which the JOURNAL now takes is the best form.

The only other question asked was Mr. Ellis's about the Associates of Honour, and how these would compare with the Honorary Fellows. Honorary Fellowship is quite different. The Society could invite anybody to be an Honorary Fellow, whereas, of course, Associates of Honour can only be chosen as a means of conferring distinction on those who are *professionally* engaged in horticulture. It is more for that particular class of people that this new order of members has been instituted.

I will ask Mr. Trotter to answer the one or two financial questions which were put.

Mr. TROTTER: With reference to Mr. Brunt's question about the Moscow Loan, there was an amount of £6,000 nominal value which used to stand in our Endowment Trust Fund Investment List. It is still in that list as it is still quoted, but we have not had any dividend for a long time. That accounts for the difference which you see in the figures of, say, the 1927 Endowment Trust Fund Investments at Wisley. The book value is £22,963 as against the market value at December 31, £21,648.

As regards Sir William Lawrence's question with regard to the Restaurant, I am afraid the real difference between the profits on the Restaurant when we have our Shows, and when the Hall is let, depends upon the consumption.

As regards the investments, the Society itself now has no investments. They have all been realized to provide funds for the building of the Halls.

A further point was the amount expended on plants at Wisley. I have the figures before me—"Plants and Seeds, £165," last year.

With regard to profits on the *Botanical Magazine* to which our President has just been referring, it was decided to write down the stock to £100 as it is so extraordinarily difficult to say what is the value of back parts and back plates, some of them coloured and some not, until they are actually sold. It was therefore thought better to take the stock at a nominal value of £100, and only bring that value and the profits into the year's figures.

The proposition for the adoption of the Report was then put and carried unanimously.

REPORT OF THE 126TH ANNUAL GENERAL MEETING. XCIV

The SECRETARY : The following nominations have been circulated to the Fellows, in accordance with Bye-law 58, and as no further nominations have been received, they are elected :

<i>President</i>	Mr. G. W. E. Loder, F.L.S.
<i>Vice-Presidents</i>	The Duke of Bedford, K.G., K.B.E., F.R.S.
	The Duke of Portland, K.G., P.C., G.C.V.O.
	The Viscount Ullswater, G.C.B.
	Sir James Knott, Bt.
	The Rt. Hon. Sir Herbert Maxwell, Bt., P.C., D.C.L., LL.D., F.R.S., V.M.H.
	Sir Daniel Morris, K.C.M.G., J.P., D.Sc., D.C.L., F.L.S., V.M.H.
	Lt.-Col. Sir David Prain, C.M.G., C.I.E., LL.D., F.R.S., F.L.S., V.M.H.
	The Hon. Vicary Gibbs, V.M.H.
<i>Treasurer</i>	Mr. E. A. Bowles, M.A., F.L.S., F.E.S., V.M.H.
	Mr. J. C. Williams.
<i>Members of Council</i>	Mr. R. D. Trotter.
<i>Auditor</i>	Sir Daniel Hall, K.C.B., LL.D., D.Sc., F.R.S.
	Mr. G. Monro, C.B.E.
	Mr. C. G. A. Nix, V.M.H.
	Alfred C. Harper.

The CHAIRMAN : I ask permission, both on my own behalf, and on behalf of the other officers whose election you have confirmed, to thank you for the honour you have done us. Of course I ask you to accept my thanks specially, because I feel I have met with the greatest indulgence at the hands of Fellows during my first year of office. I desire to take this opportunity to thank, before you all, every member of my Council for the loyal way in which they have supported me. The work undoubtedly is arduous ; it takes up a great deal of one's time, but with the loyal assistance of my colleagues, and the officers, the burden thrown upon me has been very greatly lightened. I thank you all most cordially from the bottom of my heart, for the honour you have done me in re-electing me President once more. I am sure I may say the same of the other officers whom you have elected this afternoon.

We now come to the Presentations ; the Secretary will kindly read the particulars.

Victoria Medal of Honour.—Sir William Lawrence. For his keen interest in new and rare plants.

Sir William Lawrence,—In presenting you with the Victoria Medal of Honour this afternoon, I cannot forget that the order was instituted when your illustrious father was President of this Society. I consider it a very high honour indeed to find myself, a very humble successor, in the Chair which he occupied, on the occasion on which the Society desired to show honour to his son. Indeed I may remind the Fellows that Sir William has carried on the traditions of horticulture into the third generation of his family.

I have the greatest pleasure, Sir William, in presenting you with the Victoria Medal of Honour, in remembrance of the many services you have rendered to the Horticultural Society, not only on its Council, but on its Committees.

Victoria Medal of Honour.—Mr. J. F. McLeod (on his retirement). For his active work in horticulture for the past thirty years.

Mr. McLeod,—Although your native land has claimed you once more, we cannot forget that, for the greater part of your distinguished horticultural career, you have been resident in England. I am sorry to think that the pleasure of presenting you with this mark of the recognition of your services comes at a time when you are leaving us. I hope you will enjoy a well-earned retirement and rest, but we shall not forget your services here. For over thirty years you have been a prominent member of some of the Society's most important Committees, and we shall all remember your services with pleasure and gratitude.

Victoria Medal of Honour.—Mr. Lionel de Rothschild. Well known for his magnificent exhibits and his interest in the introduction of new plants.

Ladies and Gentlemen,—I find it difficult, in fact it is impossible to compress in a few words, what the Royal Horticultural Society owes to the family of

Rothschild, and especially to its friend, Major Lionel de Rothschild, whom it has decided to honour by presenting this medal this afternoon. To every branch of horticulture Mr. Lionel de Rothschild has contributed something. He has been responsible for organizing many valuable expeditions to different parts of the world, from which our gardens have been enriched. He has founded subsidiary societies, like the Rhododendron Society, and, perhaps more precious to us all, he has been one of the most munificent patrons of the Horticultural Charities. I have the greatest possible pleasure, Mr. de Rothschild, in handing you this medal from the Royal Horticultural Society.

Victoria Medal of Honour.—Mr. L. R. Russell. For services to horticulture in the cultivation of stove and greenhouse plants.

Mr. Russell.—We hear a great deal about heredity in horticulture. It is continually cropping up, and your name of course has been a household one in horticulture for many years, but you yourself have contributed so many attractive exhibits in the line which you have made your own in horticulture, that I feel that the Royal Horticultural Society are only doing the right thing in honouring you by presenting you with the Victoria Medal of Honour. I may also mention you have been one of the most valued and constant attenders at the Floral Committee, over which I had the honour to preside once, and we thank you for your services.

Veitch Memorial Medal.—Dr. A. B. Rendle. Gold Medal and £50 on his retirement as Keeper of Botany at the Natural History Museum, and for his services to the Society.

Dr. Rendle.—It is a very proud moment for so humble a worshipper at the shrine of Botany as myself, to be the instrument of handing you this recognition of your very eminent services, from the Royal Horticultural Society. For forty-two years you have held a distinguished position at the British Museum, and of those forty-two years, no less than twenty-four have been as Keeper of the Botanical Department.

In addition to that, you have for the past ten or twelve years been our Honorary Botanist. You have served with great diligence on the Wisley Committee, and when we have been enjoying ourselves walking about the Garden and looking at the plants, you have been diligently occupied in supervising the work of the Laboratory. For these and for your services to botany generally, I ask you in the name of the Society to accept this medal and this cheque in gratitude for all the work you have done for them.

Veitch Memorial Medal.—Professor Wm. Wright Smith. For his work on the genus *Primula*.

Professor Wright Smith.—Last year I had the honour of presenting you with a cup in recognition of the work that you had done in that vast genus, as it has become, of Rhododendrons. This year the Royal Horticultural Society has elected you as one of those to receive the Veitch Medal in recognition of the work which you have done on the genus *Primula*, thus completing, as it were, the recognition of your work on the two great genera, the investigation into which Edinburgh has made its own. We are very much obliged to you, and ask your acceptance of this medal and our thanks for the work which you have done in that important genus.

Veitch Memorial Medal.—Mr. E. Beckett. Silver medal and £25 for his services to horticulture.

Mr. Beckett.—It is not easy to express the debt which the Royal Horticultural Society owes to you, and I am sure that Mr. Gibbs will allow me to say it would be difficult to exaggerate the debt which Aldenham owes to you. We are happy this afternoon to ask your acceptance of this medal in recognition of the eminent services you have rendered to horticulture generally, and to the Royal Horticultural Society in particular. Times out of mind exhibits from Aldenham have been a revelation to the visitors to our Hall. We feel very much indebted to you, and that this award was never given to anyone who deserved it more.

Lawrence Medal.—Mrs. A. Sherman Hoyt. For her exhibit of Cacti, Succulent and Desert Plants staged at the Chelsea Show on May 22, 23, and 24, 1929.

Mrs. Hoyt is sorry not to be able to come, but she wrote a letter of appreciation of the hospitality she received in England.

REPORT OF THE 126TH ANNUAL GENERAL MEETING. xcvi

Holford Medal.—Mr. Lionel de Rothschild. For his group of berried and other shrubs staged on October 23, 1929.

This medal, I feel, is very appropriately presented to you this year, a year which I said a few minutes ago has been remarkable for the profusion with which berried shrubs and fruits have been produced. It is exceedingly appropriate that this medal should go to a garden which made so great a success of the cultivation of its trees and shrubs. It was a remarkable exhibit in a most remarkable year, and I congratulate and thank you for the exhibit.

Cory Cup.—Mr. C. T. Musgrave. For his *Geniana* × *hascombensis*, which was considered to be the best new hardy plant of garden origin shown to the Society during 1929.

Mr. Musgrave,—You have achieved a distinction, perhaps greater than you realize, because you are the only member of Council to whom I have the honour of presenting an award this afternoon. But seriously, having regard to the long number of years and the great care and devotion which you have devoted to the cultivation of Gentians, it is high time that there should be some recognition of it. I am glad to think that I am the bridge over which this handsome little cup passes, through Mr. Cory's generosity, to repose in the appropriate surroundings of Hascombe.

Loder Rhododendron Cup.—Mr. George Forrest. For his introduction of new and rare species of Rhododendrons.

I very much regret Mr. Forrest is not here to-day to receive this cup, because I am sure you would all have been glad to have seen him, and have shown your appreciation. For a great many years, as you know, Mr. Forrest has made expeditions into China, and brought home unnumbered new species. It is therefore with very great gratification that the Royal Horticultural Society have found it possible to award him this cup. We are all, I am sure, extremely sorry he is not here to receive it.

George Moore Medal.—Baron Bruno von Schröder. For *Cypripedium* 'Stromboli,' which was considered to be the best new *Cypripedium* shown to the Society during 1929.

Baron Henry von Schröder,—I am presenting this medal to a member of a family whose distinction in the cultivation of Orchids is world-wide. I have great pleasure, therefore, in asking you to hand the medal to your father-in-law, and say how sorry we are that he is not here to receive it himself.

Sander Medal.—Mr. R. Paterson. For Vuylstekeara 'Edna,' Stamperland variety, which was considered to be the best new greenhouse plant shown to the Society during 1929.

I understand Mr. Merry, Mr. Paterson's gardener, is here, and that Mr. Paterson is not able to come.

Mr. Merry,—I ask you to tell Mr. Paterson that I am the instrument of presenting this medal to him with peculiar pleasure, because it not only confers distinction on him, but confers distinction on the county and even the parish in which we both live. I hope you will ask him to be kind enough to transmit some of the secret of his success in cultivation across the narrow border which separates our gardens, and instil it into some of my poor plants.

Williams Memorial Medal.—Mrs. D. Bucknall. For a group of Anemones staged on April 23, 1929.

Mrs. Bucknall,—It is with great pleasure I ask you to accept this medal. I have the greatest admiration for anybody who takes up a special flower, more especially one who has done it with such success as you have. Your exhibits have repeatedly beautified our shows here, and I am very glad it has been found possible to present you with a medal in recognition of your work on Anemones.

Williams Memorial Medal.—Messrs. H. G. Alexander, Ltd. For a group of *Cypripediums* staged on December 10, 1929.

Mr. Alexander,—I think you will easily realize what memories an occasion like this brings back to most of us here. We on the Council at any rate, and I am sure all the Fellows, do not forget your connexion with our late esteemed colleague, Sir George Holford. We know all that you did for his collection during his lifetime, and we know that you have tried to keep up the reputation now that he won. It is with very great pleasure that I hand you this medal, and wish you every success in the venture that you have undertaken.

xcviii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

I will now ask the Secretary to read out the amendments which are necessary in order to carry out the institution of the Associates of Honour.

The SECRETARY :

Bye-law 11 (a).

Persons of British nationality who are or have been employed in and have rendered distinguished service to horticulture may be elected by the Council as Associates of Honour of the Society. The number of such Associates shall not exceed 100 at any time.

Bye-law 11 (b).

There shall be presented or transmitted to each Associate of Honour, after his election, a diploma of his election under the common seal of the Society, and a badge.

Bye-law 11 (c).

Associates of Honour shall not be liable to pay any subscription or entrance fee. They shall be entitled to free admission on production of their badges to the Society's Hall, Rooms, Gardens, and Libraries, and to all Meetings, Conferences, and Shows of the Society (subject in every case to the regulations of the Council for the time being in force), a copy of the Society's JOURNAL post free, and one transferable ticket, but shall not be entitled, by virtue of being Associates of Honour, to vote at any meeting of the Society. The Bye-laws concerning the removal of Fellows shall apply (with the necessary variations) to the removal of Associates of Honour.

The CHAIRMAN : I beg to move those amendments.

Mr. CUTHBERTSON : It gives me very great pleasure to second the proposed amendment to our Bye-laws. I should just like to tell you this came up to the Council from an outsider, and it shows we constantly pay attention to suggestions from outside.

One evening last spring someone suggested to me it might be wise for the Council to institute an order as a reward for the humbler members. I brought it before my colleagues and enlisted their sympathy. A member suggested there might be some difficulty about the name, and another member came to the rescue and suggested "Associates of Honour." Then the scheme was approved by the Council unanimously. I hope it will meet with the same unanimous approval of this meeting. It is an honour, I am sure, that will be treasured in many a humble home throughout the country.

The proposition on being put was carried unanimously.

The CHAIRMAN : That concludes the business.

Mr. CURTIS : I am sure we should be entirely lacking in courtesy and equally entirely lacking in affection, if we let the opportunity go without offering to the President our very sincere thanks, not only for his Presidency, but for presiding here this afternoon. I am sure everyone who has had an award this afternoon has felt that award enhanced by the kindly way in which the presentation has been made, and I am sure we shall all delight in joining in giving him our heartiest thanks for presiding so ably this afternoon.

Mr. NORCUTT : If you will allow me, I should very much like to second that vote of thanks to our President.

In Mr. Gerald Loder we have the ideal President, a great horticulturist, a great worker, and a great organizer. I am sure we are very fortunate in having his services, and I hope we shall have his services for many years to come.

The CHAIRMAN : The best return I can make you for the very kind vote of thanks which you have just passed is not to detain you any longer. You know that I am extremely grateful to you. I have said more than I intended to say to you this afternoon, and I will only thank you once more for the very kind way in which you have shown your appreciation of my poor services.

REPORT OF THE COUNCIL FOR THE YEAR 1929.

1. **The Year 1929.**—The progress of the Society has been maintained. The increase of Fellowship has not been quite so marked as in recent years, but there is no reason to believe that there is a decline of public interest either in the work of the Society or in horticulture generally.

2. **Numerical Progress.**—

LOSS BY DEATH IN 1929.				FELLOWS ELECTED IN 1929.			
Life Fellows	..	..	9	Honorary Fellows	..	..	2
Honorary Fellows	..	..	9	Life Fellows	..	..	16
4 Guinea Fellows	..	..	10	4 Guinea Fellows	..	..	19
2 " "	..	..	217	2 " "	..	..	1,253
1 " "	..	..	154	1 " "	..	..	1,002
Associates	..	..	1	Affiliated Societies	..	..	67
				Associates	..	..	78
			400				2,437
LOSS BY RESIGNATION, ETC.				Deaths and Resignations			
4 Guinea Fellows	..	..	8		..	..	1,581
2 " "	..	..	613	NET INCREASE	..	..	856
1 " "	..	..	528				
Affiliated Societies	..	..	21	Total on November 13,			
Associates	..	..	14	1928	..	..	26,356
			1,184	Total on November 12,			
				1929	..	..	27,212

3. **Memorial to Lord Lambourne.**—The Council has elected to record the devoted and successful administration of the Society's affairs by Lord Lambourne, during his ten years' Presidency, by erecting a bas-relief portrait in a central position on the dais of the New Hall. The work has been entrusted to Mr. Reid Dick, R.A.

4. **Obituary.**—It is with regret that the loss of many valuable friends has to be recorded. Among them may be mentioned four holders of the Victoria Medal of Honour: Mr. Henry Ballantine, the well-known gardener of the late Baron Schröder, who was an active member of the Orchid Committee, and staged many beautiful exhibits at the Society's meetings; Mr. Joseph Lowe, founder of the famous nurseries for cut flowers, Messrs. Lowe & Shawyer; Mr. Charles E. Pearson, partner of Messrs. J. R. Pearson & Sons, Editor of the *Horticultural Advertiser*, a founder and first Honorary Secretary of the Horticultural Trades Association, whose interest in the affairs of the Society was evidenced by his good work and never-failing attendance at the Committees and Meetings; and Mr. P. C. M. Veitch, who will long be remembered for the many fine exhibits of new and rare plants, and his keen interest in the work of the Committees.

The following Honorary Fellows have passed away during the year: Dr. E. Goeze of Berlin, Mr. Burnet Landreth of the United States, Dr. C. L. Trabut of Algeria (to whose memorial the Society has contributed), and Professor Dr. L. Wittmack of Berlin; and of the Fellows, two members of the Fruit and Vegetable Committee, Mr. John Harrison and Mr. James Vert, and Mr. C. Kirch, who was a keen exhibitor of alpine and rock plants.

5. **The Fortnightly Meetings.**—The Fortnightly Meetings were well attended throughout the year. The New Hall has proved its value. Finer and better-staged groups were the marked feature of the more spacious accommodation; the wider gangways afforded greater comfort in circulation, and the Restaurant has proved a boon to many Fellows, visitors, and exhibitors.

6. **The Daffodil Show.**—The Daffodil Show had to be postponed owing to the inclement season, from April 9 and 10 to April 16 and 17. In spite of the season it was both well supported and attended. In 1930 the Show will be held on April 15 and 16.

7. **The Chelsea Show.**—The Chelsea Show was held on May 22, 23, and 24. The tent accommodation was again increased and added comfort to the visitors. An outstanding feature of the Show was a remarkable exhibit of Cacti, succulent and desert plants staged by Mrs. A. Sherman Hoyt of Pasadena, California. The quality of the exhibits throughout the Show was of a high character, and there was a record attendance. In 1930 the Show will be held on May 21, 22, and 23, and the Council has further improvements under consideration for the better display of exhibits and greater comfort of the Fellows.

8. **The Sherwood Cup.**—The Sherwood Cup for the best exhibit at the Chelsea Show was awarded to Messrs. Sutton & Sons for their exhibit of Greenhouse Plants.

9. **The Amateurs' Flower Show.**—The fifth Amateurs' Flower Show was held on July 9 in the New Hall, and was well supported, and the exhibits were of a high quality. In 1930 the Show will be held on June 24.

10. **Competition for Culinary Peas.**—A competition for Culinary Peas took place on July 16. The competition will be repeated, and will be held on July 15, 1930.

11. **Cherry and Fruit Show.**—At the Fortnightly Meeting on July 16 the National Farmers' Union staged a special Cherry and Fruit Show which attracted considerable attention and was a great success. A similar Show will be held at the Fortnightly Meeting on July 15, 1930.

12. **The Autumn Shows.**—Many enquiries have been made, and it has at present been found impossible to secure suitable hall accommodation to house a great Autumn Show at the desired time of the year.

The exhibitions of autumn plants, etc., of the Society were staged at four separate Shows, the first being held on September 19 and 20, primarily for open-air plants and Roses; the second on October 2 and 3, primarily for ornamental trees and shrubs; the third on October 8 and 9, being the competitive Show for fruit and vegetables; and the fourth on October 23 and 24, primarily for Orchids, stove and greenhouse plants.

Although these arrangements, a departure from the customary combined Show, were novel both to the Fellows and the exhibitors, not only were the attendances at each of the Shows large and showed an appreciation of the special efforts of the exhibitors, but the exhibits themselves were of the highest quality, being better staged, of greater individual variety, and more easily examined than under the crowded limited conditions of former Autumn Shows.

The Show for open-air plants, remarkable for the displays of Roses and Dahlias, and the Show for ornamental trees and shrubs, were voted the finest of their kind that had as yet been staged. The competitive Fruit and Vegetable Show was well attended, and the competition keen in spite of the irregularities of the season, and at the fourth Show rarely have such fine exhibits of Orchids and stove and greenhouse plants been displayed.

It has been decided to repeat the same arrangements in 1930, the first Show for open-air plants to be held on September 24 and 25, the second Show for ornamental trees and shrubs on October 1 and 2, the Fruit and Vegetable Show on October 14 and 15, and the Show for Orchids and stove and greenhouse plants on November 4 and 5.

13. **The Walnut Competition.**—In co-operation with H.M. Ministry of Agriculture and Fisheries, a competition for Walnuts was organized with the object to search the country for the best and most suitable varieties of Walnuts to grow in this country, a condition of the competition being that the successful competitors should assist in the further investigations by the free supply of a number of scions of the selected trees.

The keenness and interest in the competition was shown by the number of entries, and at the Show on November 19 nearly 500 dishes were staged.

The result of the competition was satisfactory, and about a dozen varieties have been selected as likely to be good and reliable nuts for the further trials.

The Council wishes to express its special thanks to the Ministry for its co-operation, and especially to Mr. Howard Spence, who examined, tested, and advised on all the samples sent in.

Among the other interesting exhibits on this occasion were the collections of nuts of all countries staged by Monsieur Tréve of Trévoux (Ain), samples

of nuts sent by the Chamber of Commerce, Los Angeles, and the exhibit demonstrating the method of propagating walnuts vegetatively made by the East Malling Research Station.

14. **Deputations.**—In response to invitations, the Council sent deputations to the Cornwall Spring Flower Show on April 23 and 24, the Centenary Show of the Norfolk and Norwich Horticultural Society on July 11 and 12, and the Royal Horticultural Society of Ireland's Flower Show at Dublin on August 7. The deputations were everywhere received in a most cordial and hospitable manner and, acting under the powers delegated to them, they made awards to the most meritorious exhibits.

The following Veitch Memorial Medals were awarded :

Silver Medal and £5 to the Rev. A. T. Boscawen, Ludgvan, for twelve shrubs (Cornwall Spring Flower Show, April 23, 1929) ; Bronze Medal and £2 10s. to Miss Wingfield, Pendrae, for Kurume Azaleas (Cornwall Spring Flower Show, April 23, 1929) ; Silver Medal and £5 to Mr. G. L. Lang, Great Plumstead Hall (Gardener, F. Sheldrake), for Delphiniums (Norfolk and Norwich Horticultural Society's Centenary Show, July 11, 1929) ; Bronze Medal and £2 10s. to Mr. Gordon Winter, Wrampingham, for Seedling Pinks (Norfolk and Norwich Horticultural Society's Centenary Show, July 11, 1929).

15. **Wisley.**—The work at Wisley during the past year has been mainly the continuance and development of what has already been referred to in previous Reports.

The long-continued severe weather of early spring, with more than one zero frost, caused the death of many plants at Wisley, especially on the rock garden and among shrubs from the Southern Hemisphere. It is, however, cheering to be able to record the hardiness of the great majority of the plants recently brought to our gardens from Western China, and, in spite of the dry spring and summer, that most plants have made excellent growth at Wisley. The fruit and vegetable crops have been good.

Fires on the common adjoining the garden have been a source of considerable anxiety at times, and one on the Society's property itself, extinguished before any buildings were involved, did some damage to stored crops.

16. **Visitors.**—The number of visitors (48,000) again shows a substantial increase, and Fellows are beginning to appreciate the improved facilities of access by the development of omnibus routes throughout Surrey, and by fast motor coaches between London and Guildford.

It is gratifying to record the increase in the number of organized parties visiting the Garden. Most of these parties are composed of keen gardeners who come for information, and who find much to interest them in the various trials in progress. These visits bring the Society's activities before a large number who would not otherwise have an opportunity of knowing of them. Among these may be mentioned the large party of delegates from the Garden Clubs of America ; the British Mycological Society ; the members of the Empire Conference on Meteorology ; the Cornish Growers' Association ; and the employees of the Manchester Parks.

17. **Investigations.**—Research and experimental work is being pursued along the lines detailed in the last Report. Some of the results obtained by Mr. Tincker on the effect of length of day on plants have been published in the JOURNAL. These experiments, as well as those devised to ascertain the influence of different types of soil on plant growth, are being continued. He has concluded some trials of different kinds of glass, which are also recorded in the JOURNAL. Dr. Darbishire and Mr. Buxton have carried on their experiments on the connexion between sap reaction and the colour of flowers, and a report on this also has appeared in the JOURNAL. Mr. G. F. Wilson has published a further account of his investigations on the Phlox eelworm, especially dealing with its capability of infesting other plants. Mr. Green, in addition to investigations of other diseases, is paying particular attention to black spot in Roses, the diseases of Gladioli and Freesias, and a disease of Irises which has been very prevalent during the past few years, and which results in the death of Iris roots.

The special investigations on bulb diseases were checked by the resignation of Mr. Wood, the bulb research scholar, on his appointment as advisory entomologist at Kirton, after he had completed a year's work at Wisley. It is hoped to follow them up, and to publish a report on the work already done.

Investigations on the rooting of cuttings and on pollination of orchard fruits are being continued. Mr. Wilson has published a paper dealing fully with the

insects concerned in the pollination of hardy fruits. The re-discovery of the parasite of the greenhouse White Fly at Wisley has cleared the pest out of the houses. It has enabled the Society to distribute the parasite to many whose greenhouses were infested. Where the conditions were favourable to its development, equally good results have been obtained.

Meteorological observations have been maintained and records kept of crops especially grown in connexion with the scheme of Meteorological and Crop Investigations initiated by the Ministry of Agriculture.

18. Trials.—The Standard Collections brought together in connexion with the Society's Trials are proving of particular interest to Fellows visiting Wisley, as well as of value in assisting the Committees in their judgment of novelties. The trial of Broccoli was interfered with by the severe winter, but most of the other trials in the Calendar were carried to a conclusion, and reports appear in the JOURNAL. The new trials carried out during the year include Perennial Lupins, Canterbury Bells, Fuchsias, Mossy Saxifrages, Alpine Phloxes, Annual Asters, Gaillardias, Trollius, Rhubarb, French Beans in the open and under glass, Broad Beans, Beetroots, Cauliflowers, and Cabbage Lettuce.

The trials of hardy fruits for commercial purposes have steadily increased and developed. They are open to the inspection of all interested in fruit-growing, whether for commercial or private use. About 270 varieties of different kinds of hardy fruits are under trial. In connexion with these trials (which are assisted by a grant from the Ministry of Agriculture) an extensive collection of all kinds of hardy fruits is maintained. Results of considerable value are appearing from these trials, especially concerning many of the seedlings of small fruits, or fruits introduced from abroad and hitherto little known in this country. The best of the varieties under trial at Wisley are distributed from there to ten sub-stations in various parts of the country to undergo further trial before a report is made upon them.

19. School of Horticulture.—Thirty young men, the full complement, are at present in the School taking the two years' course in the Principles and Practice of Horticulture. The School Diploma has been earned by Messrs. W. A. Dove, R. E. Hardwick, E. B. Horton, G. L. Knight, E. K. Lawrence, M. J. Peters, and J. R. Reid, and Mr. E. K. Lawrence has been awarded the Nicholson Prize for observation. It is gratifying to record that an old student of Wisley, Mr. F. C. S. Robinson, has been successful at the last examination for the National Diploma in Horticulture in gaining the Diploma in Section V, Landscape Gardening.

The entrants for the scholarships offered by the Society to working gardeners have not been as numerous hitherto as could be wished. Possibly these scholarships are not sufficiently known. Full particulars concerning them and other scholarships tenable at Wisley are given in the Book of Arrangements.

20. The Garden.—The bank adjoining the rock garden has been improved by the kindness of Mr. M. Fenwick, who has presented several more large rocks for it. Further plantings of ornamental trees and shrubs have been made in the part of the garden towards the north, and the extensive collection of Lilacs planted there is becoming established. Paths have been laid down in this part of the grounds to increase ease of access, and minor alterations already foreshadowed have been carried out elsewhere.

21. Other Educational Work.—The exhibits of some of the work being done at Wisley, which have become customary at the Chelsea Show, were again set up, and aroused much interest. An exhibit which attracted great attention was one staged at Chelsea Show by the East Malling Research Station, consisting of trees grown at Wisley on different stocks carefully excavated and mounted so as to display their whole root-systems. This exhibit was subsequently staged at Birmingham. Arrangements have been made for special exhibits dealing with insect and fungus attacks upon plants at some of the Fortnightly Shows during the coming year. A bulletin of timely horticultural work is prepared at Wisley and broadcast from several stations every week. This reaches a large public throughout England, Wales, and Ireland who do not otherwise come into direct contact with the Society's work.

These various activities have led to a considerable increase in the correspondence. It may be of interest to record that, in addition to the parcels of seeds and plants sent out at the annual distribution, over 15,000 postal packets were despatched from Wisley during the year, a large number of them dealing

with problems enunciated by enquirers concerning their gardens. In addition, very many verbal enquiries were dealt with daily at Wisley.

A new feature is the improvement in the field which has for some years been used as a sports-ground by the staff, and which is now allocated to this purpose, and the provision of a pavilion. The pavilion was opened in June, the occasion being marked by a cricket match (which resulted in a tie) between the staffs at Vincent Square and at Wisley.

22. The Masters Memorial Lectures.—The Masters Memorial Lectures (delivered annually upon recent scientific discoveries and their application to horticulture) were given on November 5 and December 10 by Mr. R. G. Hatton, M.A., on "The Relationship between Scion and Rootstock, with special reference to the Tree Fruits." For the year 1930, Professor Dr. Baur will give lectures on June 17 and 18; the first lecture will be on "New Scopes and New Methods of Plant Breeding," and the second, "The Problem of Evolution."

23. Society's Publications.—It is with great satisfaction and pride that the publication of the first two of the six volumes of the *Index Londinensis* to illustrations of flowering plants, ferns and fern allies can be announced, and that the Society is receiving recognition and congratulations from all parts of the world. This Index was commenced in 1917, and is the revision of the "Pritzel" Index. It will contain some 500,000 references, for it not only comprises the whole of the original index, but has been extended to include all references to plant illustration that have appeared in botanical and horticultural literature of importance published up to and including the year 1920.

The Society's grateful thanks are due to its Editor, Dr. Stapf, for his skill in compilation and his untiring patience; to the Director of the Royal Botanic Gardens, Kew; and to the Oxford Press for undertaking its production.

Every effort is being made to overcome the arrears of *Curtis's Botanical Magazine*, caused by the publication of the above index. Volume 153 is appearing, and the first three parts have been issued. Through the generosity of Mr. Cuthbertson a special biographical volume is in preparation, and should add to the interest of the *Botanical Magazine*.

During the year the Society has also published the following books: "Classified List of Daffodil Names," 1929 edition; "A Tentative List of Tulip Names"; "Report on the Primula Conference, 1928"; "Report on the International Exhibition of Garden Design and Conference on Garden Planning"; "Descriptive Notes on the first hundred Awards of Garden Merit to Plants"; "Field Notes of Trees, Shrubs, and Plants other than Rhododendrons, collected in Western China, by Mr. George Forrest, 1917-1919"; "List of Plants to receive Awards in 1926-1927"; and several of the garden pamphlets have been revised. A complete Index of the JOURNAL since 1840 is in the course of preparation.

The Society is assisting Dr. Camillo K. Schneider in the preparation of his monograph on "Berberis."

24. Lindley Library.—During the year about 304 books and pamphlets, in addition to periodicals, have been added to the Library, and among the books which have been purchased the following may be mentioned: Beddome's "Ferns of Southern India," Clarici's "Istoria e coltura delle piante," Clusius's "Rariorum aliquot stirpium per Hispanias observatarum historia," Camus's "Iconographie des Orchidées d'Europe," Dahl's "Pomologi," Jonstonus's "Dendrographias," Neubert's "Garten-Magazin," Rosenberg's "Corona Amaryl-lidacea," Titford's "Sketches towards a Hortus Botanicus Americanus," Schindler and Kache's "Der Garten und seine Jahreszeiten," Visiani's "Flora Dalmatica," Wilson's "China: Mother of Gardens," Zschokke's "Schweizerisches Obstbilderwerk."

25. The Victoria Medal of Honour.—The Victoria Medal of Honour has been awarded to Sir William Lawrence, Bt., for his keen interest in new and rare plants; Mr. J. F. McLeod, on his retirement, for his active work in horticulture for the past thirty years; Mr. Lionel de Rothschild, well known for his magnificent exhibits and his interest in the introduction of new plants; and Mr. L. R. Russell, for services to horticulture in the cultivation of stove and greenhouse plants.

26. The Lawrence Medal.—The Lawrence Medal for the best exhibit staged at the Society's Shows during the year has been awarded to Mrs. A. Sherman Hoyt for her exhibit of Cacti, succulent and desert plants, at Chelsea.

civ PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

27. **The Holford Medal.**—The Holford Medal for the best amateur exhibit of plants and/or flowers (fruit and vegetables excluded) shown during the year in the Halls of the Society has been awarded to Major Lionel de Rothschild for his exhibit of berried and other shrubs, on October 23.

28. **The Veitch Memorial Medal.**—Awards have been made as follows: Gold Medal and £50—To Dr. A. B. Rendle, M.A., F.R.S., F.L.S., V.M.H., on his retirement as Keeper of Botany at the Natural History Museum, and for his services to the Society.

Gold Medal—To Professor Wm. Wright Smith, M.A., F.L.S., V.M.H., for his work on the genus *Primula*.

Silver Medal and £25.—To Mr. E. Beckett, V.M.H., for his services to horticulture.

29. **The Cory Cup.**—The Cory Cup has been awarded to Mr. C. T. Musgrave for *Gentiana* \times *hascombensis*, exhibited on July 30, which was judged to be the best new hardy plant of garden origin shown to the Society in the course of the year.

30. **The Loder Rhododendron Cup.**—The Loder Rhododendron Cup has been awarded to Mr. George Forrest for his introduction of new and rare species of Rhododendrons.

31. **The George Moore Medal.**—The George Moore Medal has been awarded to Baron Bruno von Schröder for *Cypripedium* 'Stromboli,' exhibited on January 15, which was considered the best new *Cypripedium* shown to the Society in the course of the year.

32. **The Sander Medal.**—The Sander Medal has been awarded to Mr. R. Paterson for *Vuylestkeara* 'Edna,' Stamperland var., exhibited on November 5, which was considered to be the best new greenhouse plant shown to the Society in the course of the year.

33. **The Williams Memorial Medal.**—The Williams Memorial Medals for the best groups of plants of one genus which show excellence in cultivation, exhibited during the year, have been awarded to Mrs. Bucknall for *Anemones* exhibited on April 23, and to Messrs. H. G. Alexander, Ltd., for *Cypripediums* exhibited on December 10.

34. **Associates of Honour.**—The Council has felt that there are many persons connected professionally with horticulture who are deserving of recognition and honour by the Society, and it now seeks powers from the Fellows to create a special membership of the Society to be called "Associates of Honour."

It is proposed that:—

1. Persons of British nationality who have rendered distinguished service to horticulture in the course of their employment may be elected by the Council as Associates of Honour of the Society. The number of such Associates shall not exceed 100 at any time.

2. There shall be presented or transmitted to each Associate of Honour, after his election, a diploma of his election under the common seal of the Society, and a badge.

3. Associates of Honour shall not be liable to pay any subscription or entrance fee. They shall be entitled to free admission on production of their badge to the Society's Hall, Rooms, Gardens, and Libraries, and to all Meetings, Conferences, and Shows of the Society (subject in every case to the regulations of the Council for the time being in force), a copy of the Society's JOURNAL post free, and one transferable ticket, but shall not be entitled, by virtue of his being an Associate of Honour, to vote at any meeting of the Society. The Bye-laws concerning the removal of Fellows shall apply (with the necessary variations) to the removal of Associates of Honour.

4. And that the honour be conferred at the Annual General Meetings of the Society, except on the first occasion in 1930, when it will be conferred at the Spring Flower Show at Chelsea.

35. **International Horticultural Congress.**—The International Horticultural Congress has been invited by the Society to meet in London on August 7 to 15, 1930. The programme and preparations with regard to the Congress are being developed, and the Congress itself should prove one of importance and interest to horticulture. The main subject to be discussed will be "Propagation—Vegetative and Seminal" and the Committees appointed in Vienna will report on subjects such as "Nomenclature," "Awards," "Colour," etc. Arrangements are being made for a Show of special character at which will be displayed

not only the best of British horticulture, but also exhibits of many new and rare plants and novelties of recent introduction.

An interesting programme of visits to Research Stations, nurseries, and public and private gardens is in preparation, and the Council desires to offer its thanks to the Government, firms, and private owners who have generously come forward with offers of co-operation and hospitality.

Fellows and friends of the Society who are interested in the Conference are asked to inscribe their names as members on the payment of one pound to the Secretary of the Society, who will forward all the particulars of the Congress as and when published.

36. Reconstruction of the Offices and Library.—The reconstruction of the Offices and Library have been proceeding during the year. It is hoped that the work will be completed by the end of March, and that the library will be fully established in its new premises by the end of April.

The Council wishes to record the generous donation of the Carnegie United Kingdom Trust towards the expenses in connexion with the refitting of the Library.

37. Gifts to the Society.—In addition to the gifts and donations to the Society already mentioned in this Report, the Council desires to record the Society's grateful thanks to Lt.-Col. Stephenson R. Clarke for his generous donation of one hundred guineas towards the library; to Mr. Mark Fenwick for his financial assistance in the reconstruction of the Alpine Meadow at Wisley; to Mrs. A. Sherman Hoyt for her handsome donation of 1,000 dollars, the interest on which will be devoted towards the encouragement of the cultivation of Cacti, succulents, and allied plants; to Mr. A. J. Sewell, through whose kindness the Sewell Medals for the encouragement of good cultivation of alpine rock plants will now be struck in gold; to Mr. Howard Spence for a silver cup awarded at the Walnut Competition; to Mrs. Florence Bigland for a gold medal for Begonias, to be competed for at the Amateurs' Flower Show; to Mrs. Ethel du Pont, of the United States, for a silver cup for Orchids to be competed for at the Spring Show at Chelsea and the Autumn Orchid Show; to Mr. K. C. Corsar for a silver cup to be awarded for the encouragement of the cultivation of Auriculas; and to Mr. A. A. Clucas for his further donation to the funds of the Society.

The Council further desires to acknowledge gifts of seeds and plants from Fellows at home and abroad, and of books presented to the Library from publishers and others.

38. Retiring Members of Council.—The Council desires to acknowledge its appreciation of the services of its colleagues who now retire: Lt.-Col. Stephenson R. Clarke, Mr. T. Hay, and Mr. G. W. Leak. It is difficult to give adequate expression to their services. Lt.-Col. Stephenson Clarke's interest and generosity to the Society will always be remembered; Mr. T. Hay's enthusiasm and energy in bringing to the notice of the Society many new plants and plants that in recent years have gone out of cultivation will not be forgotten, and Mr. Leak's sound judgment in the affairs of the Society, both at the Council and Committee Meetings, is gratefully acknowledged. The Council is pleased to think that although they have given up their duties at the Council table, their advice and interest will be maintained and at its disposal on the Committees on which they will continue to serve.

39. The Press.—The Council desires to take this opportunity to acknowledge the kindly interest, criticism, goodwill, and publicity which the Press so generously takes and gives in the affairs of the Society.

40. Committees and Judges.—The Society's best thanks are accorded to the members of the Committees, and to the Judges who so willingly and unstintingly give up their time to assist the Council to ensure the success of the year's work.

41. Staff.—The Council takes this occasion to thank the members of the Society's staff, both at Vincent Square and Wisley, for their continued loyal and diligent work.

Signed on behalf of the Council,
G. W. E. LODER,
President.

December 31, 1929.

Dr.

ANNUAL REVENUE & EXPENDITURE ACCOUNT

To ESTABLISHMENT CHARGES—		£	s.	d.	£	s.	d.
Rent, Rates, and Taxes		2,231	4	1			
Salaries and Wages		5,709	1	2			
Other Establishment Expenses, including Light, Fuel, Stationery, Professional Fees, Repairs, and Renewals.		4,698	10	8			
					12,638	15	11
„ WISLEY—							
Excess of Expenditure over Revenue as per Wisley Revenue and Expenditure Account					12,408	17	1
„ PRINTING AND POSTAGE OF JOURNAL AND OTHER PUBLICATIONS		5,500	0	7			
Less Sales and Advertisements		1,802	3	4			
					3,697	17	3
„ STAFF PENSIONS		750	14	0			
Less contributed by Staff, as per scheme		298	17	0			
					451	17	0
„ MEETINGS—							
Expenses and Labour of Special and Other Meetings		3,962	7	1			
Less Takings		622	10	3			
					3,339	16	10
Takings at Spring Meeting	£7,173	6	8				
Less Expenses & Labour	£5,192	5	9				
Less Sum allo- cated for Overhead Expenses	500	0	0		5,692	5	9
					1,481	0	11
					1,858	15	11
„ INSPECTION OF GARDENS—							
Expenses		373	18	4			
Less Fees		347	18	2			
					26	0	2
„ CUPS AND MEDALS					581	9	1
„ CONTRIBUTION TO LINDLEY LIBRARY—							
Purchase of Books		383	2	7			
Expenses as per Trust Account		253	1	1			
					636	3	8
„ SPECIAL EXPENDITURE—							
Contribution to Tasmanian Expedition		100	0	0			
Donation to Gardeners' Benevolent Insti- tution		52	10	0			
„ Royal Gardeners' Orphan Fund		21	0	0			
„ Royal Geographical Society		10	0	0			
„ British Colour Council		10	10	0			
„ Dr. Trabut Memorial		5	0	0			
Pritzel Revision		1,314	7	0			
Herbarium		290	0	1			
					1,803	7	1
„ BOTANICAL MAGAZINE					823	7	5
„ SCHOLARSHIPS					336	11	8
„ EXAMINATIONS IN HORTICULTURE—							
Expenses		319	16	9			
Less Fees		228	5	0			
					91	11	9
„ DEPRECIATION, FURNITURE, AND APPLIANCES					523	4	5
„ NEW HALL SINKING FUND					686	0	0
„ RESTAURANTS					1,743	4	11
„ BALANCE being Excess of Revenue over Expen- diture carried to General Reserve Account					14,220	15	3
					£52,527	18	7

FOR YEAR ENDED 31st DECEMBER, 1929.

Cr.

	£	s.	d.	£	s.	d.	
By ANNUAL SUBSCRIPTIONS				43,215	6	0	
„ ENTRANCE FEES				627	18	0	
„ DONATIONS	213	2	10				
Less transferred to Mrs. Hoyt Prize Fund	207	7	10				
					5	15	0
„ DIVIDENDS AND INTEREST	1,816	2	3				
„ Do. Do. DAVIS TRUST	51	8	10				
				1,867	11	1	
„ PROFIT ON SALE OF INVESTMENTS				657	13	9	
„ HALL LETTINGS	7,330	5	9				
Less Expenses and Labour	1,928	17	6				
				5,401	8	3	
„ LIFE COMPOSITIONS— Being amount paid by Fellows, now deceased				199	10	0	
„ RENT OF FREEHOLD PROPERTY (WISLEY)				250	8	6	
„ INCOME TAX RESERVE WRITTEN BACK				302	8	0	

£52,527 18 7

Dr.

ROYAL HORTICULTURAL SOCIETY—

LIABILITIES.

	£	s.	d.	£	s.	d.
To CAPITAL FUNDS ACCOUNT				38,947	4	2
„ LIFE COMPOSITIONS	12,931	16	0			
<i>Less</i> Fees paid by Fellows, now deceased	199	10	0			
	12,732	6	0			
<i>Add</i> Life Compositions paid during year	592	4	0			
				13,324	10	0
„ SUNDRY CREDITORS—						
On Open Accounts	10,677	4	4			
Westminster Bank	3,536	0	3			
Cash awaiting Investment	1,205	18	6			
				15,419	3	1
„ SUBSCRIPTIONS, paid in advance	655	1	9			
Do. do. Pritzel Index	421	17	4			
				1,076	19	1
„ DEPRECIATION AND RENEWALS FUND—						
Balance at 31st December, 1928	6,207	16	4			
<i>Add</i> ed during 1929	833	12	9			
				7,041	9	1
„ NEW HALL SINKING FUND				709	10	0
„ WEATHER INSURANCE FUND				3,000	0	0
„ SUPPLEMENTARY PENSION FUND				749	18	1
„ MEMORIAL AND OTHER TRUST FUNDS—						
Balances in hands of Society as per Schedule				404	2	5
„ GENERAL RESERVE FUND	161,967	17	10			
<i>Add</i> Balance as per Revenue and Expendi- ture Account	14,220	15	3			
				176,188	13	1

£256,861 9 0

BALANCE SHEET, 31st DECEMBER, 1929.

Cr.

		ASSETS.					
		£	s.	d.	£	s.	d.
By CAPITAL EXPENDITURE—							
Old Hall, Offices and Equip-							
ment, 31st Dec., 1928		44,543	3	5			
Additions, 1929 ^½		15,845	17	10			
						60,389	1 3
New Hall, Restaurant and							
Equipment, 31st Dec., 1928		144,994	13	3			
Additions, 1929		21,698	18	0			
						166,693	11 3
						227,082	12 6
„ FREEHOLD PROPERTY, WISLEY—							
31st December, 1928						13,158	13 9
„ BOTANICAL MAGAZINE—							
Stock					100	0	0
Work in advance					681	11	9
						781	11 9
„ DEPRECIATION AND RENEWAL FUND INVEST-							
MENTS AT COST					6,207	16	4
Add Cash awaiting Investment					833	12	9
						7,041	9 1
(Market value of Investments at 31st December, 1929, £6,436 16s. 4d.)							
„ NEW HALL SINKING FUND INVESTMENTS AT COST					701	13	4
Add Cash awaiting Investment					7	16	8
						709	10 0
(Market value of Investments at 31st December, 1929, £677 16s. 0d.)							
„ WEATHER INSURANCE FUND INVESTMENTS AT COST						3,000	0 0
(Market value of Investments at 31st December, 1929, £3,032 15s. 11d.)							
„ SUPPLEMENTARY PENSION FUND INVESTMENTS							
AT COST					635	9	0
Add Cash awaiting Investment					114	9	1
						749	18 1
(Market value of Investments at 31st December, 1929, £611 7s. 10d.)							
„ SUNDRY DEBTORS AND PAYMENTS IN ADVANCE .						3,069	3 3
„ CASH ON DEPOSIT—							
Pritzel Subscriptions in Advance						421	17 4
„ CASH AT BANK AND IN HAND						846	13 3

£256,861 9 0

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on the 31st December, 1929. In the total of Assets, £256,861 9s. 0d., are included investments and Cash amounting to a total sum of £7,041 9s. 1d., representing depreciation reserves on account of such matters as roof renewal, hall painting, &c., and these funds are not available for the General Purposes of the Society.

ALFRED C. HARPER, F.C.A., Auditor

(HARPER BROTHERS & FRATHER, Chartered Accountants),

35 Great Tower Street, London, E.C. 3.

7th January, 1930.

	£	s.	d.	£	s.	d.
TO SALARIES—						
Gardens, Estate, and Research Station	4,894	14	4			
„ LABOUR—						
Gardens, Estate, and Research Station	5,559	12	3			
				10,454	6	7
„ ESTABLISHMENT EXPENSES—						
Including Rates, Insurance, Water, Repairs, Postage, and Travelling				2,271	17	2
„ GARDENS AND ESTATE EXPENSES—						
Including Manure, Implements, Trees, and Shrubs				1,700	10	2
„ LABORATORY EXPENSES				103	9	6
„ SPECIAL EXPENDITURE—						
Calculating Machine				55	0	0
„ STAFF PENSIONS	639	12	4			
Less contributed by Staff, as per scheme	317	12	0			
				322	0	4
„ DEPRECIATION—						
Glass Houses, Plant, and Materials	641	1	3			
Motors	89	11	6			
				730	12	9
				£15,637	16	6

ACCOUNT FOR YEAR ENDED 31st DECEMBER, 1929.

Cr.

	£	s.	d.
By DIVIDENDS AND INTEREST	1,384	12	0
„ PRODUCE SOLD	651	6	3
„ ANALYSIS FEES	15	10	0
„ STUDENTS' FEES	47	5	0
„ CONTRIBUTION BY MINISTRY OF AGRICULTURE—			
On account of Fruit Testing Station	868	1	8
„ FIRE INSURANCE CLAIM—			
Amount recovered	262	4	6
„ BALANCE, being excess of Expenditure over Income, carried to			
Revenue and Expenditure Account, Vincent Square	12,408	17	1

£15,637 16 6

Dr.

WISLEY GARDENS—BALANCE

LIABILITIES.					
	£	s.	d.	£	s.
To CAPITAL FUNDS ACCOUNT—					
As at 31st December, 1928	36,865	0	6		
Less Decrease in value of Assets on Valuation	28	16	0		
	<hr/>			36,836	4 6
„ ENDOWMENT TRUST FUND				23,342	7 11
(The difference between this Fund and the Investment Account on the Assets side is due to a change in the Investments which was made in 1921.)					
„ DEPRECIATION AND RENEWALS FUND—					
As at 31st December, 1928	5,611	19	3		
Added to Fund, 1929	250	0	0		
	<hr/>			5,861	19 3

£66,040 11 8

ASSETS.

	£	s.	d.	£	s.	d.
By CAPITAL EXPENDITURE—						
Laboratory, Dwelling Houses, Glass Houses, Ranges, etc.—As at 31st December, 1928				33,371	10	10
N.B.—The Hanbury Trust Estate is, under the Trust Deed, vested in the Society only so long as it is in the position to use it as an Experimental Garden. Accordingly the Expenditure thereon by the Society is an Asset only so long as the Gardens continue to be used by the Society.						
„ STOCK FUEL				150	0	0
„ MOTOR CAR AND LORRY—						
As at 31st December, 1928	94	11	6			
Less Depreciation	89	11	6			
				5	0	0
„ VALUATION OF PLANT, LIVE STOCK, AND LOOSE EFFECTS—As valued by the Director				3,259	4	0
„ LIBRARY				429	2	4
„ ENDOWMENT TRUST FUND INVESTMENTS AT COST (Market value of Investments at 31st Dec., 1929, £21,648 7s. 5d.)				22,963	15	3
„ DEPRECIATION AND RENEWALS FUND INVESTMENTS AT COST	5,611	19	3			
Add Cash for Investment	250	0	0			
				5,861	19	3
(Market value of Investments at 31st Dec., 1929, £6,204 9s. 0d.)						
				£66,040	11	8

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position on the 31st December, 1929.

ALFRED C. HARPER, F.C.A., *Auditor*

(HARPER BROTHERS & FEATHER, *Chartered Accountants*),

35 Great Tower Street, London, E.C. 3.

7th January, 1930.

ROYAL HORTICULTURAL SOCIETY—TRUST

	Amount of Fund represented by Investments at Cost.			Income Balance in hand 31st Dec. 1928.		
	£	s.	d.	£	s.	d.
1. ALFRED DAVIS TRUST FUND . . .	946	0	3	<i>nil</i>		
2. WILLIAMS MEMORIAL FUND . . .	245	11	9	9	13	6
3. MASTERS MEMORIAL FUND . . .	542	17	0	127	19	5
4. NICHOLSON MEMORIAL FUND . . .	180	14	4	<i>nil</i>		
5. SCHRÖDER PENSION FUND . . .	557	14	6	6	6	8
6. LINDLEY LIBRARY TRUST . . .	10,270	3	10 (a)	10	0	0
7. SIR JAMES KNOTT TRUST . . .	600	0	0	142	10	0
8. VEITCH MEMORIAL TRUST FUND . . .	1,673	19	1	265	19	5
9. MOORE MEDAL TRUST FUND . . .	190	10	6	11	4	0
10. SEWELL MEDAL TRUST FUND . . .	500	0	0 (c)	<i>nil</i>		
11. MRS. HOYT PRIZE FUND . . .	207	7	10 (d)	<i>nil</i>		

Notes on above Funds :

1. Bequeathed to the Society in 1870 for Annual prizes or any other object the Council may determine.

2. Raised by donations in 1891 in memory of the late Mr. B. S. Williams towards the provision of prizes and medals.

3. Raised by donations in 1908 in memory of the late Dr. Masters towards the provision of one or more annual lectures.

4. Raised by donations in 1908 in memory of the late Mr. Geo. Nicholson to provide prizes for Wisley Students.

5. Provided by the Society in memory of the late Baron Schröder to pay to the Gardeners' Royal Benevolent Institution for one pension.

6. The nucleus of the Library is the fine collection of books and pamphlets which belonged to the late Dr. Lindley. It has been added to by the Society and by private donors and the value of the Library included in the above Fund is £8,706 8s. 3d.

FUND ACCOUNTS, 31st DECEMBER, 1929.

Dividends and Interest received during 1929.	<u>£</u>	<u>s.</u>	<u>d.</u>	Expenditure in 1929 in accordance with the Trust.	<u>£</u>	<u>s.</u>	<u>d.</u>	Income Balance in hand of R.H.S. 31st Dec., 1929.	<u>£</u>	<u>s.</u>	<u>d.</u>
51	8	10		51	8	10		<i>nil</i>			
9	17	5		8	8	0		11	2	11	
20	0	0		20	0	0		127	19	5	
7	8	6		7	8	6		<i>nil</i>			
20	0	0		20	0	0		6	6	8	
309	3	4	(b)	319	3	4		<i>nil</i>			
30	0	0		115	10	0		57	0	0	
83	13	11		165	12	6		184	0	10	
9	6	9		7	9	6		13	1	3	
4	11	4		<i>nil</i>				4	11	4	
<i>nil</i>				<i>nil</i>				<i>nil</i>			
Total as per Balance Sheet	<u>£</u>	<u>404</u>	<u>2</u>		<u>5</u>						

(a) Investment . £ 1,458 15 7

Value of Library
on 31st Dec.,
1928 . . . 8,323 5 8

Books purchased
by Society in
1929 . . . 383 2 7

Donation from
Lieut.-Col.
Stephenson R.
Clarke . . . 105 0 0

£10,270 3 10

(b) Includes contribution by
R.H.S. in 1929, £253 1s. 1d.

(c) Includes further donation,
30th Nov., 1929, £400.

(d) Presented 22nd May, 1929.
Funded 10th Dec., 1929.

7. Presented to the Society in 1920 for the purpose of providing a scholarship tenable at Wisley.

8. Instituted in 1870 in commemoration of the late Mr. James Veitch for the encouragement of Horticulture. Fund vested in the Society in 1922.

9. Presented to the Society in 1926 by the late Mr. G. F. Moore to provide a medal annually for the best new *Cypripedium* shown to the Society during the year.

10. Presented to the Society in 1928 by Mr. A. J. Sewell to provide medals for Rock Garden Plants.

11. Presented by Mrs. Sherman Hoyt as a donation and funded by the Society to provide prizes for the encouragement of the growth of Cacti and Succulents. The Pritzel Revision Fund has been utilized in the publication of the *Index Londinensis*, Volume I. of which has been issued during the year.

SCIENTIFIC COMMITTEE.

JULY 16, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and six other members present.

Cymbidium atropurpureum.—A Botanical Certificate was unanimously recommended for *Cymbidium atropurpureum*, a species with dark chocolate flowers, from the Philippines, shown by Messrs. Charlesworth.

Zanonia sp.—Dr. Voelcker showed two seeds of the Cucurbitaceous plants, *Zanonia* sp., from Australia. The seeds are about 1 inch by $\frac{1}{2}$ inch, flattened and winged on each side with a transparent wing about 3 inches long and $1\frac{1}{2}$ inch wide.

Vicia sp.—Dr. Voelcker also showed dry specimens of the plant raised from seeds which had proved poisonous to stock. It is a species of *Vicia* with small purple flowers.

Tulip with Aerial Bulbs.—Stems of the Tulip 'Murillo' bearing small bulbs in the leaf axils were sent by Mr. M. A. Hall of Edmonton.

'Hen and Chickens' Goatsbeard.—Mr. F. W. Thorrington sent specimens of the common Goatsbeard, with proliferous heads somewhat similar to those seen in the 'Hen and Chickens' Daisy.

Pollination in orchards.—Mr. C. H. Hooper referred to a Pear orchard in which the Pears 'Fertility' and 'Doyenne du Comice' appeared to be mutually cross-pollinated with good results.

He also referred to a Cherry orchard at Littlebourne where the varieties had been planted in blocks of forty trees (8 by 5) according to the time of ripening, and where fruiting had not been good. The varieties in proximity to one another had been ill-chosen from the point of view of pollination. In another orchard, near Sevenoaks, twenty acres of 'Amber Bigarreau' had been planted and had yielded but a small crop. A few 'Early Amber' had been interspersed and these crop regularly and well. Some benefit had been seen in the 'Amber Bigarreau' immediately surrounding the 'Early Amber,' but this had not gone further than one tree deep.

SCIENTIFIC COMMITTEE, JULY 30, 1929.

Sir DAVID PRAIN, F.R.S., V.M.H., in the Chair, and ten other members present.

Dialysed corolla in Digitalis.—Mr. Chittenden showed a spike of *Digitalis ambigua* from Wisley in which the corolla was deeply cut to the base of the tube.

Monarda crosses.—Mr. Amos Perry sent a series of seedling *Monardas* raised between *M. didyma*, *M. violacea*, and *M. Russelliana*. They were varying shades of scarlet and purple, and showed also variations in the form and texture of the foliage.

The Committee unanimously recommended a Certificate of Appreciation to Mr. Perry for his work with these plants.

Scabiosa Columbaria var.—Mr. Fraser showed flowers from different seedlings of *Scabiosa Columbaria* raised from seed taken from a plant with heliotrope flowers which he had collected on the Surrey Downs. All the seedlings had produced flowers of the same coloration as the parent.

Gymnosporangium clavariaeforme.—He also showed shoots and fruits of Hawthorn bearing the cluster cups of *Gymnosporangium clavariaeforme*, the spring stage of which occurs on *Juniperus communis*. The cluster cups were on shoots and leaves as well as on the fruits.

Rosa chinensis viridiflora.—Mr. Fraser also showed flowers of the green Rose, *Rosa chinensis viridiflora*, which appears to have originated about 1855.

SCIENTIFIC COMMITTEE, AUGUST 13, 1929.

Sir DAVID PRAIN, F.R.S., V.M.H., in the Chair, and five other members present.

Linaria proliferous.—Mr. Hales showed shoots of *Linaria vulgaris* very profuse towards the top. He had noticed this before in this plant in dry summers. With rain the normal flowering occurred.

Cosmos bipinnatus.—Mr. Fraser drew attention to the much earlier flowering of this species now than when it was first introduced.

Anagallis varieties.—He also showed dry specimens of *Anagallis officinalis* and several forms including an erect growing one, and one with white flowers with a deep-coloured eye, as well as the blue form which is common in some parts of the country, and which Sir David Prain said occurred abundantly around Behar in India to the exclusion of the red form.

Habranthus Bagnoldii.—Major Pam sent for naming a bulbous plant of unknown origin with yellow flowers produced before the leaves, which appeared to be *Habranthus Bagnoldii*, a Chilean species.

Doubling in tufted Violas.—A flower (one typical of the plant that bore it) was shown having an extra petal, and thus showing a tendency to doubling.

SCIENTIFIC COMMITTEE, AUGUST 27, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and six other members present.

British forms of Plantago.—Mr. Fraser showed dried examples of forms of *Plantago lanceolata* with paniced inflorescence, of *P. maritima* with a paniced inflorescence, and of short- and long-leaved forms of *Plantago major*.

Plum seedling of 'Victoria'.—Mr. Worsley showed fruit of a seedling Plum, raised from the variety 'Victoria' and somewhat resembling 'Pond's Seedling,' which he said was not subject to silver leaf and should be propagated by suckers like Pershore.

Ulmus seedling.—Mr. Bowles showed seedlings of silver variegated Elm, some of which showed variegation in the leaves.

Oenothera trichocalyx.—Mr. Hosking showed a flowering plant of this recently introduced species.

Plantago cretica.—He also showed a plant of *Plantago cretica* with ripe seed produced in clustered sessile heads at the base of the plant. This plant dries up in the rainless season and, blowing over the desert, scatters its seed.

SCIENTIFIC COMMITTEE, SEPTEMBER 10, 1929.

Sir DAVID PRAIN, F.R.S., V.M.H., in the Chair, and six other members present.

Mr. Hosking reported that a Plum similar to that shown at the last meeting by Mr. Worsley had occurred with Mr. Evans at Merton.

Various plants were submitted by Mr. Hosking, including *Artemisia gnaphaloides*, *Oenothera taraxacifolia*, *Clematis Davidiana*, *Polygonum Aubertii*, *Buddleia superba* var. *rosea*, *Solanum laciniatum*, *S. sisymbriifolium*, *S. atropurpureum*, *S. verbascifolium*.

Sudden dying of Clematis.—Professor Armstrong referred to the sudden dying of a form of *Clematis Jackmanni* in his garden. It was suggested that this was due to the base of the plant being exposed to too great heat.

Diseased Browallia.—Mr. Wood showed plants of *Browallia speciosa* which had damaged tips due to the Begonia mite.

Plants from British Columbia.—Dr. Hindley showed *Mitella Breweriana* and a composite which Mr. Fraser took for identification.

Mentha.—Mr. Fraser exhibited *Mentha aquatica* and its var. *subglabra* of Baker; also *Mentha aquatica* and its var. *subglabra* from several stations.

CXVIII PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

SCIENTIFIC COMMITTEE, SEPTEMBER 19, 1929.

Sir DAVID PRAIN, F.R.S., V.M.H., in the Chair, and eight other members present.

Hybrid Poppy.—Mr. Worsdell exhibited a dried specimen of a Poppy found at Ashford in Kent which showed *Papaver somniferum* × with some other species, possibly *P. rupifragum* × *P. Rhoeas*. Mr. Bowles stated that several years ago a plant occurred in his garden of *P. somniferum* × *P. pilosum*.

Mr. Hosking showed the hybrid *Clematis Joviniana* (*C. Vitalba* × *Davidiana*), *Clematis tangutica*, a species closely allied to *C. orientalis*, from which it differs in having larger flowers and downy stems; *Vitis heterophylla*; *Lonicera nitida*; and a more upright growing species under the name of *L. amoena*, the latter being taken by Mr. Bowles for determination.

Mildew on Groundsel.—Mr. Worsley brought plants of groundsel from his garden affected by a Mildew, *Erysiphe Cichoracearum*, which he stated was always active in September.

SCIENTIFIC COMMITTEE, OCTOBER 1, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and twelve other members present.

Lonicera amoena.—The plant shown at the last meeting for naming proved to be *Lonicera amoena*, syn. *Ligustrina yunnanensis*.

Cherry Pollination.—Mr. Hooper drew attention to the statement that pollen of flowers had been found many hundreds of feet above orchards and remarked that with Apples and Pears it had been proved that the pollen was not carried by wind. He suggested that experiments might be set afoot to discover whether the pollen of cherries was wind-borne.

Hybrid Mints.—Mr. J. Fraser showed dried specimens of a long series of hybrids between *Mentha longifolia* and *M. rotundifolia*.

Beech Bark fungus.—Mr. Odell drew attention to specimens of Beech bark bearing tendrils of fungus origin of an orange colour. Subsequent examination showed these to consist of multitudes of spores of a fungus belonging to the genus *Libertella fugina*.

Sectorial chimera in Gladiolus.—Mr. Tincker showed a *Gladiolus* having half of the spike with white, half with purple flowers, the terminal flower being half white, half purple.

Seedling Abutilon megapotaemicum.—Lady R. Christie sent a seedling *Abutilon* which was probably a hybrid between *A. megapotaemicum* and a variety of the common greenhouse *Abutilon*.

SCIENTIFIC COMMITTEE, OCTOBER 23, 1929.

Mr. A. WORSLEY in the Chair, and five other members present.

Chrysopsis incana.—Mr. Fraser referred to a plant brought by Dr. Hindley, originating in British Columbia, which proved to be *Chrysopsis incana*.

Nierembergia frutescens.—He also showed *Nierembergia frutescens*, a species which is hardy, he said, in most parts of England, but is short-lived.

Persea gratissima.—Mr. G. P. Baker showed a germinating seed of *Persea gratissima* which he had raised.

SCIENTIFIC COMMITTEE, NOVEMBER 5, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and ten other members present.

White Blackberry.—Mr. Chittenden showed albino fruits of a Blackberry having the distinct blackberry flavour, which came from a field near Coventry, where many bushes with albino fruits were growing.

Seedling Apples.—Mr. Worsley remarked upon the progeny of 'Cox's Orange Pippin' and said that some seedlings at least resemble 'Cox's Orange' in many characters, particularly in the texture of their flesh. 'The Ribston Pippin' seedlings were not recognizable as such.

Xeranthemum annuum.—Mr. Hosking showed a specimen of this South European composite.

SCIENTIFIC COMMITTEE, NOVEMBER 19, 1929.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, ten other members and Mr. VAN DE WEYER (visitor) present.

Coniferous seedling.—Mr. Fraser showed a series of seedlings of British conifers, including *Taxus*, *Pinus sylvestris* and *Juniperus communis*, with its variety *nana* (= *montana*) and a form of *nana* from Shetland.

Chlorosis.—Mr. Odell drew attention to the amount of chlorosis in Junipers about Wendover, where the shrubs were suffering greatly.

Hippeastrum bicolor.—Mr. Hay showed a plant under this name from Chile, which Mr. Worsley took for further examination, as he thought it probable that two plants, at least, had been confused.

Cyclamen Rohlfsianum.—Mr. Van de Weyer showed a plant of this uncommon species raised from tubers imported from Tunis. It has large mottled leaves and a cone of anthers rather protuberant. Mr. Loder proposed and Mr. Preston seconded, and it was carried unanimously, that a Botanical Certificate should be awarded to this plant.

Yellow-seeded Iris foetidissima.—Mr. Van de Weyer also showed a yellow-seeded form of *Iris foetidissima* which he had found growing on the Isle of Purbeck.

Begonia with superior ovary.—He also recorded the rather rare occurrence of a *Begonia* in his garden with a superior ovary.

SCIENTIFIC COMMITTEE, JANUARY 14, 1930.

Sir DAVID PRAIN, F.R.S., V.M.H., in the Chair, and seven other members present, with Mr. LOFTHOUSE, a visitor.

Spanish flora.—Mr. A. Lofthouse showed a long series of dried specimens of plants which he had collected in Spain and most of which he had now growing in his garden in Middlesbrough. The thanks of the Committee were unanimously accorded to Mr. Lofthouse.

Lachnus salicis.—Mr. Hales showed a specimen of this large aphid, which was feeding on Willows at the Chelsea Physic Garden.

Varieties of Ivy.—Mr. Hosking showed specimens of dwarf Ivies and remarked upon the difficulty of naming them correctly. Four congested forms were shown.

Pollination of Cherries.—Mr. C. H. Hooper showed a chart which he had drawn up to illustrate the cross-pollination of Cherries. He had placed the varieties in order of ripening, and had endeavoured to indicate their relative fertility with different other varieties.

Festuca ovina varieties.—Mr. Fraser showed a series of forms of *Festuca ovina*, including the typical *ovina* from Richmond Park and the much richer soil of Ham Common; the variety *hispidula* from Swanage and from Kingston Vale, and a glaucous form of it, and also the variety *formula*.

SCIENTIFIC COMMITTEE, JANUARY 28, 1930.

Sir DAVID PRAIN, F.R.S., V.M.H., in the Chair, and nine other members present.

Lawn grasses.—Mr. J. Fraser showed a series of varieties of *Poa pratensis* (*subcoerulea*, common on wall tops, and *angustifolia* with filiform leaves) and *Poa trivialis*, which he thought the better grass in moister places. He found that at Kew *P. pratensis* smothered out *P. annua*. He also showed *Agrostis vulgaris*, and remarked that it was being used now to a large extent in lawn mixtures, and *A. alba*, which in the variety *stolonifera* had a creeping habit that made it undesirable for lawns, as it could not readily be cut. Mr. Hales said that he found *Poa annua* the most satisfactory grass at Chelsea Physic Garden, where it persisted when other grasses completely failed. Mr. Tincker said that various forms of *Agrostis vulgaris* and *A. canina* were now being isolated and tested for their value on golf greens.

SCIENTIFIC COMMITTEE, FEBRUARY 11, 1930.

Mr. A. WORSLEY in the Chair, and seven other members present.

Salix sp.—Mr. J. Fraser showed dried specimens of *Salix phyllicifolia* from the Orkneys, where it is usually very dwarf owing to the death of the tips of the twigs through gales. He also showed *S. phyllicifolia* × *repens* from the same locality.

Meconopsis regia.—Mr. Hay showed a plant of *Meconopsis regia* to illustrate the difference between the winter rosette of that plant and that of *M. superba*. There is a marked difference in the shape of the leaves. Both have silvery foliage.

The epidermal tissues of plants.—Dr. Rodman showed a series of beautiful photographs of the ash of epidermal tissues of certain plants. The contour of every part of these tissues was seen in the ash and it consisted for the most part of carbonate of lime, though occasionally silica was also present. A unanimous vote of thanks was accorded to Dr. Rodman.

Large Form of Galanthus Whittallii.—Mr. J. C. Watt sent a Snowdrop with large flowers, and Mr. Bowles brought one which practically matched it. It is a form of *G. Elwesii* with flowers about 1½ inches long.

SCIENTIFIC COMMITTEE, FEBRUARY 25, 1930.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and five other members present.

Erica ciliaris, etc.—Mr. J. Fraser showed *Erica ciliaris* from its British habitats in Dorset and Cornwall, and various hybrids, some probably secondary between it and *E. tetralix*—known collectively as *E. × Watsonii*.

Mormodes Garnettii.—This deep brown Orchid from Brazil and Guiana was exhibited.

Watsonia aleitroides.—Major Johnson showed *Watsonia aleitroides* (*Bot. Mag.* t. 533) from the Cape. It is a peculiar species with tubular flowers, the outer segments of which completely enclose the inner. A Botanical Certificate was recommended for this plant.

Sparaxis bulbifera albiflora.—A plant also came from Major Johnson under the name *S. grandiflora alba*, but it was apparently the plant described as *S. bulbifera albiflora*, also from the Cape.

Pink Anemones.—Some Anemones collected wild of a beautiful rose-pink colour, very like the variety known as 'Rosalie,' were shown. They appear to belong to the group called *Anemone pavonina*.

FRUIT AND VEGETABLE COMMITTEE.

JULY 16, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and eight other members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Sutton, Reading, for Peas.

Silver Knightian Medal.

To Messrs. Carter, Raynes Park, for Peas.

Silver Hogg Medal.

To British Glasshouse Produce Marketing Association, Ltd., Southampton Row, W.C. 1, for collection of fruits packed for market.

Other Exhibits.

Swanley Horticultural College : " soft " fruits.

Messrs. W. Seabrook, Chelmsford : " soft " fruits.

Messrs. Geo. Bunyard, Maidstone : Cherries.

Mr. Canning, Maidenhead : seedling Cherry.

FRUIT AND VEGETABLE COMMITTEE, JULY 30, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and twelve other members present.

Awards Recommended :—

Gold Medal.

To S. Wallrock, Esq., Stanmore, for collection of fruit trees in pots.

Award of Merit.

Tomato 'Radio.' After trial at Wisley, July 11, 1929. Raised by Mr. Robert Holmes, and sent by Messrs. W. H. Simpson, of Monument Road, Birmingham. Plant with very short internodes fruiting at the sixth node. Trusses much branched, averaging eight fruits. Fruits of bright colour, 2 inches diameter, regular, six to eight to a pound. Flesh firm, thick, of good flavour; crop good.

Tomato 'Essex Wonder.' After trial at Wisley, July 11, 1929. Introduced and sent by Messrs. Dobbie, of Edinburgh. Plant with short internodes fruiting at the eighth node. Trusses simple, overlap each other, averaging eight fruits. Fruits of bright colour, 2½ inches diameter, flat round, five or six to a pound. Flesh firm, thick, of good flavour; crop good.

Other Exhibits.

Messrs. Stark, Fakenham : Tomato 'Table Dainty.'

Mr. A. F. Linfield, Old Bletchley : Gooseberries.

The recommendations made by the sub-committee visiting Wisley to judge the trials of Cabbage Lettuce, Broad Beans, and Tomatos, were confirmed.

CABBAGE LETTUCE.

Award of Merit.

Alike { 'Unrivalled,' sent by Messrs. Middlehursts.
'Market Favourite' or 'Unrivalled,' sent by Messrs. Clucas.

Alike { 'Konfit,' sent by Messrs. Daehnfeldt & Jensen.
'Yellow Longstanding,' sent by Messrs. Heinemann.

'Continuity,' sent by Messrs. Daniels, W. H. Simpson, Barr, and Dobbie.

Highly Commended.

- 'New York,' sent by Messrs. Cooper, Taber & Co.
 - 'New York' selected, sent by Messrs. Finney.
- 'Neapolitan,' sent by Messrs. Dobbie.
- 'Wonderful,' or 'New York,' sent by Messrs. Clucas.
 - 'Wonderful,' sent by Messrs. Morris, Dobbie, Webb, Middlehursts, Daehnfeldt & Jensen, and Harrison.
 - 'Hercules,' sent by Messrs. Dobbie.
 - 'May King,' sent by Messrs. Dickson & Robinson, Harrison, Heinemann, Clucas, Middlehursts, Olsen, Zwaan & van der Molen.
- 'Paragon,' sent by Messrs. Webb.
 - 'Trocadero,' sent by Messrs. Nutting.
 - 'Big Boston,' sent by Messrs. Burpee.
- 'White Big Boston,' sent by Messrs. Burpee.
 - 'Bohemia,' sent by Messrs. Heinemann.
 - 'Best of All,' sent by Messrs. Heinemann.
 - 'Perfect Gem,' sent by R. Veitch, Dawkins, Nutting, and Carter.
 - 'Wayahead,' sent by Messrs. Burpee, Barr, and Carter.
 - 'Defiance Long Stander,' sent by Messrs. Clucas.
 - 'Californian Cream Butter,' sent by Messrs. Burpee.
- 'Tom Thumb,' sent by Messrs. Morris, W. Simpson, Speed, Olsen, and Dobbie.
 - 'Tom Thumb' selected, sent by Messrs. Webb and Barr.

Commended.

- 'Distinction,' sent by Messrs. Dickson & Robinson.
 - 'All the Year Round' improved, sent by Messrs. Cooper-Taber.
 - 'All the Year Round,' sent by Messrs. Cooper-Taber, Finney, W. Simpson, Clucas, Middlehursts, Cullen, R. Veitch, Nutting, Barr, and Dobbie.
 - 'All the Year Round' reselected, sent by Messrs. Carter.
 - 'Criterion,' sent by Messrs. Webb.
 - 'Winter Density,' sent by Messrs. Nutting.

BROAD BEANS.

Award of Merit.

- 'Exhibition Giant,' sent by Messrs. King, Essex.
- 'Champion Longpod,' sent by Messrs. Dobbie, Edinburgh.
- 'Olympic Green Longpod,' sent by Messrs. Hurst, London.
- 'Green Leviathan,' sent by Messrs. Carter, London.

Highly Commended.

- 'Unrivalled Green Windsor,' sent by Messrs. Sutton, Slough.
 - 'Four Seeded Windsor' reselected, sent by Messrs. Hurst, Feering.
 - 'Seville Longpod,' sent by Messrs. Watkins & Simpson.
 - 'Longpod' selected, sent by Messrs. Webb, Stourbridge.
 - 'Mammoth Longpod,' sent by Messrs. Pennell, Lincoln.
 - 'Prolific,' sent by Messrs. Dickson & Robinson.
 - 'Exhibition Longpod,' sent by Messrs. Clucas, Ormskirk.
- 'Exhibition' (Bunyards), sent by Messrs. W. H. Simpson.
 - 'Exhibition Longpod' sent by Messrs. Pennells, Lincoln.
 - 'Hangdown,' sent by Messrs. Sluis en Groot.
 - 'Sussex Wonder Longpod,' sent by Messrs. Watkins & Simpson.
 - 'Kinver Mammoth,' sent by Messrs. Webb.
 - 'Mammoth New Green Longpod,' sent by Messrs. Barr, London.

Commended.

- 'Mammoth Windsor,' sent by Messrs. Carter.
- 'Homestead Green Windsor,' sent by Messrs. Carter.
- 'Four-seeded Green Windsor,' sent by Messrs. Middlehursts.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 13, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and nineteen other members present.

No awards were recommended on this occasion.

Exhibits.

Mr. W. Hargrave, Pulborough : Tomato 'Brimsbury Chester.'
 The Duke of Westminster, Eaton Hall, Chester : Peach 'Westminster.'
 Mr. J. Kettle, Wimborne : Raspberry 'Lloyd George.'
 Mr. J. C. Allgrove, Slough : collection of Gooseberries.
 Mr. T. Pateman, Hatfield : Black Currant 'Florence.'

FRUIT AND VEGETABLE COMMITTEE, AUGUST 27, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and seven other members present.

No awards were recommended on this occasion.

It was recommended that the Plum 'Black Prince,' exhibited by Messrs. Laxton, Bedford, and the Plum (seedling from Victoria) exhibited by Mr. Worsley, Isleworth, be included in the Commercial Fruit Trials at Wisley.

Exhibits.

Messrs. S. Spooner, Hounslow : collection of fruit.
 Messrs. Daniels, Norwich : Black Currant 'Daniel's September.'
 Sir Thos. Lipton, Southgate : Melon 'Sir Thomas Lipton.'
 Mr. R. Morrison, Stirling : Gooseberry 'Stirling Castle.'
 Mr. E. Johnson, Brentwood : Strawberries for opinion.

The recommendations made by the sub-committee visiting Wisley to judge the trial of French Beans were confirmed.

DWARF FRENCH BEANS.*Waxpods.**Award of Merit.*

'Perfection Butter,' sent by Messrs. Barr, Covent Garden.

Highly Commended.

'Schlossperle,' sent by Messrs. Heinemann, Erfurt.
 'Kidney Wax,' sent by Messrs. Burpee, California.

*Edible Green podded.**Commended.*

'Saxa Stringless,' sent by Messrs. Zwaan & van der Molen, and Heinemann.

*Tough Green podded.**First-class Certificate.*

'The Wonder,' sent by Messrs. Watkins & Simpson.

Award of Merit.

'The Wonder,' sent by Messrs. Dobbie, Edinburgh.
 'Satisfaction,' sent by Messrs. Dobbie, Edinburgh.
 'Unrivalled,' sent by Messrs. Clucas, Ormskirk.

Highly Commended.

'Fifty Days,' sent by Messrs. Carter, London.
 'African Wonder,' sent by Messrs. Cooper-Taber.
 'Ne Plus Ultra' selected, sent by Messrs. Hurst.
 'Bounteous,' sent by Messrs. Watkins & Simpson.
 'Superlative' and 'Magpie,' sent by Messrs. Nutting, Carter, and Harrison.
 'Canadian Wonder,' sent by Messrs. Harrison.
 'Canadian Express,' sent by Messrs. Carter.
 'Lightning,' sent by Messrs. Carter.

Commended.

- 'Harbinger,' sent by Messrs. Webb.
- 'Holborn Wonder Stringless,' sent by Messrs. Carter.
- 'Supreme,' sent by Messrs. Webb.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 10, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and eleven other members present.

Awards Recommended :—

Silver-gilt Hogg Medal.

To Messrs. Rivers, Sawbridgeworth, for collection of fruit trees in pots.

Other Exhibits.

- Miss L. Croxton, South Norwood : seedling Apple.
- Mr. H. Vernon, Reading ; Plum for opinion.
- Mr. M. L. Garrett, Rugby : Melon.
- Miss Acland, Oxford : Apple 'Admiral Acland.'
- Mr. J. Kettle, Wimborne : Raspberries.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 19, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and twelve other members present.

Awards Recommended :—

It was recommended that the Apple 'Epicure,' exhibited by Messrs. Laxton, Bedford, be awarded the Bunyard Cup. This Apple was recommended as the most promising seedling Apple which had not previously been exhibited at any of the Society's meetings at the meeting, on August 28, 1928 (see JOURNAL, 54, p. xcvi), and this recommendation is now confirmed. The fruit is medium in size, round, and brightly streaked dull red and crimson over rich yellow. The flesh is firm, crisp, juicy and of excellent flavour. The eye is small and closed, the stem short and slender in a shallow cavity.

Other Exhibits.

- Mr. C. H. Lawes, Broughton : Apple for opinion.
- Messrs. Brookes, Weston-super-Mare : Apple 'Beeley Pippin.'
- Mrs. Vaughan, Sevenoaks : Apple 'Sevenoaks Beauty.'
- Dr. A. H. Williams, Horsham : Tomato 'Primrose Bloom.'
- Miss M. Whittaker, Bishop's Stortford : seedling Peach.

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 2, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and eleven other members present.

Awards Recommended :—

Gold Medal.

To Messrs. J. C. Allgrove, Slough, for collection of fruit.

Silver-gilt Hogg Medal.

To Messrs. Geo. Bunyard, Maidstone, for collection of fruit.

Silver Hogg Medal.

To Messrs. Laxton, Bedford, for collection of fruit.

Other Exhibits.

- Messrs. Laxton, Bedford : Pear 'Laxton's Prolific.'
- Messrs. Abbott, Ardleigh : seedling Apple.
- Mr. G. Nadeson, Morecambe : seedling Apple.

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 8, 1929.

Mr. C. G. A. NIX, V.M.H., in the Chair, and twenty-five other members present.

Awards Recommended :—*Gold Medal.*

- To Messrs. Geo. Bunyard, Maidstone, for collection of fruit.
- To Messrs. R. C. Notcutt, Woodbridge, for collection of fruit.
- To Messrs. J. C. Allgrove, Slough, for collection of fruit.
- To Messrs. Sutton, Reading, for vegetables.
- To Messrs. Dobbie, Edinburgh, for potatoes.

Silver-gilt Hogg Medal.

- To Messrs. J. Cheal, Crawley, for collection of fruit.
- To Messrs. T. Rivers, Sawbridgeworth, for collection of fruit.
- To Messrs. Laxton, Bedford, for collection of fruit.
- To University of Reading, Reading, for collection of fruit.
- To The Barnham Nurseries, Barnham, for collection of fruit.

Silver-gilt Knightian Medal.

- To Messrs. Barr, Covent Garden, for vegetables.

Silver Hogg Medal.

- To Messrs. Daniels, Norwich, for collection of fruit.
- To Messrs. J. Almond, Eppingham, for Grapes.

Hogg Medal.

- To Mr. J. A. W. Whittall, Haslemere, for collection of Apples.
- To Messrs. Spooner, Hounslow, for collection of fruit.

Award of Merit.

To Apple 'Howgate Wonder' (votes unanimous) from Mr. Geo. Wratten, Bembridge. This is a large culinary apple of the 'Beauty of Kent' type. It is conical, rounded at the base and tapering slightly to the eye. It is greenish-yellow, flushed and streaked with bright red. The eye is closed, set in a ribbed angular basin. The stalk is short, stout, set in a deep and broad cavity. This apple has been previously exhibited in the month of February and it "keeps" well. The cooking qualities proved excellent. This Apple was recommended for inclusion in the Commercial Fruit Trials at Wisley.

Other Exhibits.

- Mr. J. C. Hunt, Hertford : Apple 'Joseph Hunt.'
- Mr. T. B. Hatfield, Liverpool : seedling Apple.
- Mr. F. Wooland, Brighton : seedling Apple.
- Mr. J. A. Meekle, Bourne : two seedling Apples.
- Sir Wm. Lawrence, Bt., Burford : Cape Gooseberry 'Gold Nugget.'
- Mr. S. G. Brown, Shepperton : *Musa sapientum* and *Passiflora edulis*.
- Mr. H. Chapman, Rye : Apple 'Saltcote Pippin.'
- Messrs. Clarke, Dover : fruit.
- Mr. F. W. Crook, Swanley : Onion 'Swanley Model.'

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 23, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and nine other members present.

No awards were recommended on this occasion.

Exhibits.

- Mr. J. F. Hill, Westbury : Marrow 'Hill's New Green.'
- Mr. H. H. Brinson, Reading : Apples 'Yellow Boy,' 'Nellie Hamilton,' 'Harry Herbert,' and 'George Frederick.'
- Miss Morris, Aylesbury : Apple 'Yaxley Wonder.'
- Mr. J. W. Crabb, Brentwood : seedling Apple.
- Sir M. Beeton, Walton-on-Thames : collection of Apples and Pears.
- Mr. A. Worsley, Isleworth : seedling Apple.

The recommendations made by the sub-committee visiting Wisley to judge the trial of Runner Beans were confirmed.

Award of Merit.

Runner Bean 'Tip Top.' August 30, 1929. Sent by Mr. A. Mitchelson of Burnet Hill Gardens, Womersley, Guildford. Plant vigorous, pods straight, 9 to 15 inches long, $\frac{1}{2}$ to $1\frac{1}{2}$ inch wide, three to five in a cluster. Seeds large, purple with black markings, near 'Best of All' type of seed.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 5, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and eight other members present.

No awards were recommended on this occasion.

Exhibits.

- Mr. G. Middlebrook, Retford: Apple 'Middlebrook Seedling.'
- Mr. A. Allen, Emsworth: seedling Apple.
- Mr. F. Groom, Belvedere: seedling Apple.
- Mr. H. Riddle, Great Berkhamstead: seedling Apple.
- Lady Thornycroft, Bembridge: Apples 'Sir Douglas Haig' and 'Sir Benjamin Baker.'
- Miss M. Bullock, Bewdley: seedling Pear.
- Mr. H. Mason, Reigate: Raspberry 'The Reigate.'

The recommendations made by the sub-committee visiting Wisley to judge the trials of Cauliflowers and Long Beet were confirmed.

CAULIFLOWERS.

Award of Merit.

- 'Early Six Weeks,' sent by Messrs. Barr.
- 'All the Year Round,' sent by Messrs. Hurst, Zwaan & van der Molen, Dobbie, Daniels, Kelway, Watkins & Simpson, Finney, W. H. Simpson, Clucas, Cullen, Nutting, Dickson & Robinson, Bath, Barr, and Harrison.
- Alike { 'All the Year Round' selected, sent by Messrs. Carter.
- 'All the Year Round,' Driancourt's Stock, sent by Messrs. Carter.
- 'All Seasons,' sent by Messrs. Harrison and Cooper-Taber.
- 'Driancourt,' sent by Messrs. Nutting, R. Veitch, Morris, and Speed.
- 'Danish Giant,' sent by Messrs. Zwaan & van der Molen.
- 'Reliance,' sent by Messrs. Dickson & Robinson, and Bath.

Highly Commended.

- 'White Queen,' sent by Messrs. Speed.
- 'Primo,' sent by Messrs. Zwaan & van der Molen.
- 'Early Favourite,' sent by Messrs. Barr.
- 'Danish Giant,' sent by Messrs. Hansen.
- 'Le Cerf,' sent by Messrs. Zwaan & de Wiljes.

Commended.

- 'Early Dwarf Best of All,' sent by Messrs. Barr.
- 'Snowball,' sent by Messrs. Dobbie.
- 'Mont Blanc,' sent by Messrs. Clucas.

LONG BEET.

Award of Merit.

- 'Cheltenham,' sent by Messrs. Watkins & Simpson, and Nutting.
- 'Non Bleeding,' sent by Messrs. Zwaan & van der Molen.
- 'Brydon's Exhibition,' sent by Messrs. Hurst.
- 'Dell's Crimson,' sent by Messrs. Barr, and Nutting.

Highly Commended.

- 'Cheltenham' selected, sent by Messrs. Cooper-Taber.
- Alike { 'Cheltenham Greentop,' sent by Messrs. Morris, Finney, Clucas, Carter, Dobbie, Zwaan & van der Molen.
- 'Cheltenham Greenleaf,' sent by Messrs. Harrison.
- 'Greentop' selected, sent by Messrs. Dobbie.
- 'Greentop,' from Messrs. Sutton.

- Alike { 'Cheltenham Greentop,' sent by Messrs. Zwaan & de Wiljes.
 darker { 'Greentop,' sent by Messrs. Webb.
 foliage { 'Amsterdam Market,' sent by Messrs. Zwaan & van der Molen.
 form { 'Northumberland Dwarf,' sent by Messrs. Nutting.
 Alike { 'Victoria,' sent by Messrs. Harrison.
 { 'Covent Garden,' sent by Messrs. Barr.
 { 'Non Bleeding,' sent by W. H. Simpson.
 { 'Blood Red,' sent by Messrs. Carter.
 Alike { 'Exhibition (Veitch),' sent by Messrs. R. Veitch.
 { 'Dark Red Salad,' sent by Messrs. Daniels.
 { 'Purple (Dobbie's),' sent by Messrs. Dobbie, and Morris.
 { 'Volunteer,' sent by Messrs. Webb.
 Alike { 'Exhibition Black,' sent by Messrs. Stuart & Mein.
 { 'Black,' sent by Messrs. Sutton.
 { 'Pragnell's Exhibition,' sent by Messrs. Hurst.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 19, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and ten other members present.

Awards Recommended :—*Award of Merit.*

To Apple 'Woolbrook Pippin' (votes unanimous) from Messrs. Stevens, Sidmouth. Of medium size, sometimes a little large, evenly rounded and regular in shape; bright red nearly all over on a mellow yellow skin; eye open in a wide shallow cavity; stalk barely protruding from the rather deep cavity; flesh white, crisp, and briskly flavoured. This Apple was recommended for inclusion in the Commercial Fruit Trials at Wisley.

Other Exhibits.

Mr. E. S. Day, Warley: Apples 'Day's Pomona' and 'Day's Seedling.'
 Messrs. Stevens, Sidmouth: Apple 'Woolbrook Russet.'

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 10, 1929.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and eleven other members present.

Gold Medal.

To the Hon. Vicary Gibbs (gr. Mr. Beckett), Aldenham, for collection of fruit.

Other Exhibits.

Messrs. J. and A. H. Crook, Beaconsfield: Pear 'Glou Morceau' and Apple 'Ellison's Orange.'

Mr. W. H. Bedford, Ballycastle: Apple 'Fleurville Seedling.'

Mr. A. Worsley, Isleworth: seedling Apple.

Mrs. Fleming, Uxbridge: preserves.

Mrs. Wintour, Loose: preserves.

FRUIT AND VEGETABLE COMMITTEE, JANUARY 14, 1930.

Mr. C. G. A. NIX, V.M.H., in the Chair, and eleven other members present.

Awards Recommended :—*Gold Medal.*

To Messrs. Sutton, Reading, for vegetables.

Silver Hogg Medal.

To Messrs. Geo. Bunyard, Maidstone, for collection of Apples.

Other Exhibits.

Mr. H. Chapman, Rye: Apple 'Saltcote Pippin.'

Mr. P. Wilks, Sandway: seedling Apple.

Messrs. Laxton, Bedford: Apple 'Superb.'

Mrs. Wintour, Loose: preserves.

FLOWER AND VEGETABLE COMMITTEE, JANUARY 28, 1930.

Mr. W. POUPART, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—

Silver Hogg Medal.

To Messrs. J. Cheal, Crawley, for collection of fruit.

Other Exhibits.

Messrs. Sutton, Reading : vegetables.

Mr. J. H. Langham, Tamerton Foliot : Apple 'Tamar Seedling.'

Mrs. Wintour, Loose : preserves.

Messrs. H. G. Sewell, South Kensington : preserves.

FLOWER AND VEGETABLE COMMITTEE, FEBRUARY 11, 1930.

Mr. J. CHEAL, V.M.H., in the Chair, and fifteen other members present.

Awards Recommended :—

Silver-gilt Hogg Medal.

To Messrs. J. C. Allgrove, Slough, for collection of Apples and Pears.

Other Exhibits.

Mr. A. C. Mills, Warwick : seedling Apple.

Mr. W. E. Belton, Little Driffield : seedling Apple.

Mr. J. C. Allgrove, Slough : seedling Apple.

Mr. H. S. Dean, Peterborough : seedling Apple.

Mr. E. Neal, Crawley : Apple 'Worcester Pearmain.'

Mr. E. Beckett, Aldenham : Apple 'Scarlet Nonpareil.'

The recommendations made by the sub-committee visiting Wisley to judge the trial of Leeks were confirmed.

LEEKS, 1929-30.

First-class Certificate.

'Winter King,' sent by Messrs. J. L. Clucas.

Award of Merit.

'Goliath,' sent by Messrs. Stuart & Mein.

'Renton's Monarch,' sent by Messrs. R. Veitch.

Alike { 'Monarch,' sent by Messrs. Nutting.

{ 'Tête d'Angville (ou d'Elbeuf),' sent by Messrs. Rivoire.

Highly Commended.

'Champion,' sent by Messrs. Nutting.

'The Lyon,' sent by Messrs. R. Veitch.

'Royal Favourite,' sent by Messrs. Zwaan & van der Molen.

'Musselburgh' selected, sent by J. Carter.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 25, 1930.

Mr. J. CHEAL, V.M.H., in the Chair, and sixteen other members present.

Awards Recommended :—

Silver Hogg Medal.

To Messrs. Rivers, Sawbridgeworth, for Citrus fruits.

Silver Knightian Medal.

To Messrs. Dobbie, Edinburgh, for collection of Potatoes.

Other Exhibits.

Messrs. Geo. Bunyard, Maidstone : Apples.

FLORAL COMMITTEE.

JULY 9, 1929.

AT THE AMATEURS' SHOW.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and twelve other members present.

The awards recommended to Canterbury Bells on trial at Wisley were confirmed.

Other Exhibit.

Major S. J. Thompson, D.S.O., Wolverhampton : Begonias.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and twenty-one other members present.

Awards Recommended :—

Award of Merit.

To *Aster adfinis* as a half-hardy annual flowering plant (votes 9 for, 3 against), from Messrs. Sutton, Reading. A slender, branched annual, 8 inches high. Leaves linear, slightly hairy, pale green. Flower-heads nearly 2 inches in diameter, disc yellow, rays bright blue, extended horizontally. A South African species.

To *Cyananthus Farreri* as a flowering plant for the alpine house (votes unanimous), from Lady Aberconway and the Hon. H. D. McLaren, Bodnant. A choice dwarf alpine plant of close, tufted habit like that of a small 'mossy' Saxifrage. The flowers appear singly at the ends of short trailing shoots. The calyx is densely covered with brown hairs, the corolla deep violet-blue, tubular, somewhat spreading above.

To *Cirsium occidentale* var. *Coulteri* as a half-hardy biennial flowering plant (votes 11 for, 4 against), from T. Hay, Esq., Hyde Park. A tall Californian Thistle of striking appearance. The sharply toothed and undulate leaves, like the stem, are silvery. The large flower-heads are composed of numerous cherry-red florets surrounded by a silver-grey, spiny involucre.

Other Exhibits.

Mr. Isaac Holdforth, Woking : *Erica Searlei aurea*.

G. W. E. Loder, Esq., Ardingly : *Gilia californica*, *Lonicera Giralddii*, *Acer Pseudoplatanus* var. *Nizettii*.

Messrs. Sutton, Reading : *Aster tenellus*.

V. C. Vickers, Esq., Aldenham : *Rhododendron* sp. F. 21750.

The Duke of Wellington, Basingstoke : *Actinidia chinensis*.

FLORAL COMMITTEE, JULY 16, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and thirteen other members present.

Awards Recommended :—

Gold Medal.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.

To Messrs. H. J. Jones, Lewisham, for Delphiniums.

Silver-gilt Banksian Medal.

- To Messrs. Dobbie, Edinburgh, for Lilies.
- To Messrs. Hewitt, Solihull, for Delphiniums.
- To Messrs. Russell, Richmond, for Begonias.

Silver Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Dianthus 'Sweet Wivelsfield.'
- To Messrs. Artindale, Sheffield, for Eremuri.
- To Messrs. Barr, Taplow, for herbaceous plants.
- To Mr. T. Bones, Cheshunt, for Delphiniums.
- To Messrs. B. R. Cant, Colchester, for Roses.
- To Messrs. F. Cant, Colchester, for Roses.
- To Mr. T. Carlile, Twyford, for Delphiniums.
- To Messrs. Dickson, Belfast, for Roses.
- To Mr. J. Douglas, Great Bookham, for Border Carnations.
- To Messrs. Ladhams, Southampton, for herbaceous plants.
- To Messrs. McGredy, Portadown, for Roses.
- To Messrs. Prichard, Christchurch, for herbaceous plants and aquatics.
- To Messrs. Waterer, Sons & Crisp, Twyford, for herbaceous plants.

Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
- To Mr. Archer and Daughter, Ashford, for Roses.
- To The Burbage Nurseries, Hinckley, for Roses.
- To Messrs. Ben Cant, Friern Barnet, for Roses.
- To Messrs. Engelmann, Saffron Walden, for Carnations.
- To Mr. E. B. Le Grice, North Walsham, for Roses.
- To Mr. A. Perry, Enfield, for *Anthemis tinctoria* 'Perry's Variety.'
- To Mr. J. H. Pemberton, Havering, for Roses.
- To Messrs. Wilson & Agar, Reading, for Roses.

Award of Merit.

To *Anthemis tinctoria* 'Perry's Variety,' for cutting (votes 9 for), from Mr. Amos Perry, Enfield. A very free flowering hardy herbaceous plant growing about 2 to 2½ feet in height. The ray florets are bright yellow and the disc orange.

To Carnation 'Beauty of Cambridge' for cutting (votes unanimous), from Messrs. Bath, Wisbech. An excellent border variety with pale yellow flowers of very good form borne on stiff wiry stems.

Selected for trial at Wisley.

- Delphinium seedlings from W. H. Grant, Esq., Croydon.
- Delphinium 'Eileen May Robinson' from Mr. H. Robinson, Hinckley.
- Delphinium 'Hewitt's Superb' from Messrs. Hewitt, Solihull.
- Eschscholzia 'Eastern Queen' from Mr. W. H. Gardiner, Thorrington.

Other Exhibits.

- Mr. J. C. Beck, Henley-on-Thames : Carnation 'Norexa.'
- Messrs. Bunyard, Maidstone : Roses.
- Mr. T. Carlile, Twyford : Gaillardias.
- Messrs. Clark, Dover : herbaceous plants.
- C. Guinness, Esq., Hitchin : Roses.
- Misses Hopkins, Coulsdon : herbaceous plants.
- Messrs. McGredy, Portadown : Rose 'Delightful.'
- Mr. A. Miles, Bromley : herbaceous plants.
- Messrs. Prichard, Christchurch : Achillea 'Gold Plate' and *Eryngium oliverianum plenum*.
- L. de Rothschild, Esq., Exbury : *Nymphaea* 'Arethusa' and *N.* 'Marguerite Laplace.'
- Messrs. Wilson & Agar, Reading : herbaceous plants.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and fifteen other members present.

Awards Recommended :—

Banksian Medal.

- To Messrs. Tucker, Ltd., Oxford, for herbaceous and rock plants.

Award of Merit.

To *Gentiana hexaphylla* as a hardy flowering plant for the rock garden (votes 13 for, 1 against), from Andrew Harley, Esq., Dollar, Perthshire. A dwarf Chinese species. The stems are purplish, bearing whorls of small, lanceolate leaves. The solitary flowers are of medium size, blue, with pale yellowish markings.

To *Philadelphus insignis* as a hardy flowering shrub (votes unanimous), from C. T. Musgrave, Esq., Godalming. One of the most attractive single-flowered kinds. The flowers are large, pure white, and very pleasantly scented; the panicles well disposed in large sprays.

To *Verbena corymbosa* as a hardy flowering plant (votes unanimous), from Messrs. C. Elliott, Ltd., Stevenage. A Chilean species collected by Mr. Elliott (No. 354). The leaves are opposite, ovate-lanceolate, and toothed. The flowers are rather small, dark bluish-violet, arranged in dense terminal corymbs.

Other Exhibits.

Messrs. Elliott, Stevenage: *Malesherbia linearifolia*.

Messrs. Maxwell & Beale, Broadstone: rock plants.

Mr. P. S. Patrick, Sevenoaks: shrubs.

Mr. Amos Perry, Enfield: *Dianthus deltoides plenus*.

Messrs. Prichard, Christchurch: *Verbascum Brusa*.

Mr. G. E. P. Wood, Ashted: rock plants.

FLORAL COMMITTEE, JULY 30, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and fourteen other members present.

Awards Recommended:—*Gold Medal.*

To Messrs. H. J. Jones, Lewisham, for Phloxes.

Silver-gilt Banksian Medal.

To Messrs. Kelway, Langport, for Gladioli.

To Messrs. Sutton, Reading, for Annuals.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Daniels, Norwich, for Larkspurs.

To Messrs. Engelmänn, Saffron Walden, for Carnations.

To Mr. J. H. Pemberton, Havering, for Roses.

To Messrs. Prichard, Christchurch, for herbaceous plants.

To Messrs. Prior, Colchester, for Roses.

To Messrs. Stark, Fakenham, for Sidalceas.

To The Suffolk Seed Stores, Woodbridge, for herbaceous plants.

To Captain Symons-Jeune, Old Windsor, for Phloxes.

Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Mr. S. J. Goodliffe, Bishop's Stortford, for Phloxes.

To Mr. H. Hemsley, Crawley, for Sidalceas.

To Mr. A. Miles, Bromley, for herbaceous plants.

To Mr. H. Prins, Wisbech, for Gladioli.

To Messrs. Rich & Cooling, Bath, for Phloxes.

Award of Merit.

To *Campanula carpatica* 'Chewton Joy' for the herbaceous border (votes 11 for), from Messrs. Prichard, Christchurch. A very free-flowering dwarf form of *C. carpatica* with medium-sized pale blue flowers.

The following plants received awards after trial at Wisley:

Award of Merit.

To *Delphinium* 'Ann Baker' from Messrs. Baker, Codsall. Height 7 feet; spikes 18 to 24 inches long; side spikes many, strong; flowers single, 3½ inches diameter, pale sky-blue, flushed mauve at margins; eye large, blackish-brown.

To Delphinium 'Cambria' from Mr. W. Spencer, Milford, Surrey. Height 6 feet; spikes 18 to 24 inches long, tapering; side spikes many, strong; flowers 2 to 2½ inches diameter, semi-double, outer petals pale sky-blue, inner petals pale silvery-mauve; eye blackish.

To Delphinium 'Dawn' from Mr. W. Spencer, Milford. Height 6 feet; spikes 18 to 28 inches long, tapering; side spikes many, strong; flowers 2½ to 3 inches diameter, semi-double, outer petals pale silvery sky-blue, inner petals pale silvery sky-blue overlaid with mauve; eye dark brown with whitish-mauve stripe at middle of segments.

To Delphinium 'Mrs. Newton Lees' from Messrs. Blackmore & Langdon, Bath. Height 5½ feet; spikes 18 to 22 inches long, tapering; side spikes many, strong; flowers 1½ to 2½ inches diameter, semi-double, outer petals pale sky-blue, inner petals pale mauve; eye brownish, striped pale mauve.

To Delphinium 'Sir Douglas Haig' from Messrs. Blackmore & Langdon, Bath, and Messrs. H. J. Jones, Lewisham. For description see R.H.S. JOURNAL, vol. 51, p. 137.

Poppy 'New Double Queen' from Messrs. Barr, London. Raised by Messrs. Yates. Plant 2½ feet tall; flowers 4 inches diameter, double, white edged pink, rose and rosy-red shades. Flowering from July 3. *Papaver Rhoeas* type.

To Poppy 'Taplow Pink' from Messrs. Barr, London. Plant 3½ feet tall; flowers 4½ to 5 inches diameter, double pale rose-pink. Flowering from July 5. *Papaver somniferum* type.

The awards recommended to Herbaceous Veronicas and Perennial Gaillardias on trial at Wisley were confirmed.

Selected for trial at Wisley.

Eschscholzia 'Double Carmine Queen' from Mr. W. H. Gardiner, Thornington.

Eschscholzia 'Flambeau' from Mr. W. H. Gardiner.

Hemerocallis 'George Yeld' from Mr. A. Perry, Enfield.

Phlox 'Magna Charta' from Capt. Symons-Jeune, Old Windsor.

Phlox 'Mrs. Symons-Jeune' from Captain Symons-Jeune, Old Windsor.

Other Exhibits.

Messrs. Allwood, Haywards Heath: Dianthus 'Sweet Wivelsfield.'

Messrs. Clark, Dover: herbaceous plants.

Misses Hopkins, Coulsdon: herbaceous plants.

Miss Pearson, Kingston Hill: Pelargonium 'Janet Pearson.'

Viscountess St. Cyres, Lymington: Lavender 'Walhampton Giant.'

Messrs. Stark, Fakenham: *Papaver nudicaule* 'Fakenham Hybrid.'

T. H. Thelwell, Esq., Whitchurch: seedling Gladiolus.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and eighteen other members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Russell, Richmond, for *Nepenthes* and *Nymphaeas*.

Silver Banksian Medal.

To Mr. Amos Perry, Enfield, for Lilies and other herbaceous plants.

Banksian Medal.

To Messrs. Russell, Richmond, for *Ixoras*.

Award of Merit.

To *Allium flavum* as a hardy flowering plant (votes 6 for, 2 against), from Mr. Amos Perry, Enfield. A pleasing little Italian species. The leaves and scapes are glaucous, the small, campanulate flowers pale yellow, pendulous, in nicely proportioned umbels.

To *Gentiana* × *hascombensis* as a hardy flowering plant for the rock garden (votes unanimous), from C. T. Musgrave, Esq., Godalming. A notable hybrid

of *G. Lagodechiana* and *G. septemfida* var. *cordifolia*. It is a distinct improvement on *G. septemfida*, larger in leaf and inflorescence. The flower-colour is a uniform bright blue.

To *Gentiana Lagodechiana* Hascombe variety as a hardy flowering plant for the rock garden (votes unanimous), from C. T. Musgrave, Esq., Godalming. A very desirable variety. In habit resembling the type, it is superior in its large, dark blue flowers, spotted with white in the corolla-tube.

To *Pentstemon Eatonii* as a tender flowering plant (votes 8 for, 3 against), from T. Hay, Esq., Hyde Park. A tall and graceful plant. The opposite leaves are ovate and pointed. The deep scarlet flowers are arranged in long, narrow panicles.

To *Vriesia splendens major* as an ornamental foliage and flowering plant for the stove (votes 9 for), from Messrs. Sander, St. Albans. From the centre of a basal tuft of chocolate-blotched, green leaves arises a tall, flattened inflorescence. The flowers are small and whitish, but the bracts are bright scarlet and add greatly to the plant's decorative value.

Other Exhibits.

G. P. Baker, Esq., Sevenoaks : *Campanula thessalica*.

T. Hay, Esq., Hyde Park : *Hydrangea villosa*.

C. Ingram, Esq., Benenden : *Watsonia* sp.

G. W. E. Loder, Esq., Ardingly : *Eucryphia Billardieri*.

H. Armytage Moore, Esq., Saintfield : *Actinidia coriacea*.

Mr. Amos Perry, Enfield : *Allium cernuum*, *Zygadenus glaberrimus*.

Viscountess St. Cyres, Lymington : *Coriaria japonica*.

FLORAL COMMITTEE, AUGUST 13, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen other members present.

Awards Recommended :—

Gold Medal.

To Messrs. H. J. Jones, Lewisham, for Phloxes.

To Messrs. Unwin, Histon, for Gladioli.

Silver-gilt Banksian Medal.

To Messrs. Bath, Wisbech, for Gladioli.

To Mr. H. Prins, Wisbech, for Gladioli.

Silver Banksian Medal.

To Messrs. Cuthbert, Southgate, for Gladioli.

To The Hon. Vicary Gibbs (gr. Mr. E. Beckett), Elstree, for Pentstemons.

To Messrs. Kelway, Langport, for Gladioli.

To Messrs. Pearson, Lowdham, for Marigolds.

To Mr. J. H. Pemberton, Havering, for Roses.

To Messrs. Prichard, Christchurch, for herbaceous plants.

Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cheal, Crawley, for Dahlias.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Clark, Dover, for herbaceous plants.

To Messrs. Engelmann, Saffron Walden, for Carnations.

To Mr. J. Golding, Fordham, for Scabious.

To Mr. S. J. Goodliffe, Bishop's Stortford, for herbaceous plants.

To Mr. Hemsley, Crawley, for Dahlias and Sidalceas.

To Messrs. Ladhams, Southampton, for herbaceous plants.

To Messrs. Redgrove, Borough Green, for Phloxes.

To Messrs. Stewart, Wimborne, for Gladioli.

To Messrs. Wakeley, London, for Gladioli.

To Mr. G. G. Whitelegg, Chislehurst, for Gladioli.

Award of Merit.

To *Salvia patens* 'Cambridge Blue' for bedding (votes unanimous), from T. Hay, Esq., M.V.O., V.M.H., Hyde Park, London. An excellent light-blue variety of the well-known *Salvia patens*.

To *Streptocarpus* 'Improved Aldenham Strain' as a greenhouse plant (votes unanimous), from the Hon. Vicary Gibbs (gr. Mr. E. Beckett), Elstree. A good strain bearing very large flowers of white, pink, mauve, violet, and purplish-red shades, many being beautifully marked.

Selected for trial at Wisley.

Viola cornuta 'Lavender Gem' from Messrs. Watkins & Simpson, London.

Viola cornuta 'White Gem' from Messrs. Watkins & Simpson, London.

The following Dahlias were selected by the Joint Dahlia Committee:—

From Mr. A. J. Cobb, Reading: 'Mabel Crossling' (Min. Pæony).

From Mr. F. Smith, Morecambe: 'Mrs. Musgrave Hoyle' (Charm).

From Messrs. Stredwick, St. Leonards-on-Sea: 'Mrs. D. Durham' (Dec.), 'Mrs. W. E. Phillips' (Dec.), 'Ringdove' (Cactus), 'Winnie' (Cactus).

Other Exhibits.

Messrs. Cheal, Crawley: Dahlias.

Mrs. G. M. Dodd, Bracknell: Dahlias.

The Hon. Vicary Gibbs, Elstree: Phloxes.

W. Hargrave, Esq., Fulborough: Dahlias.

The Misses Hopkins, Coulsdon: herbaceous plants.

Messrs. Russell, Richmond: Phloxes and Fuchsias.

Messrs. Stark, Fakenham: Sidalceas and Poppies.

Mr. G. E. P. Wood, Ashted: herbaceous plants.

Mr. W. Yandell, Maidenhead: Violas.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and sixteen other members present.

Awards Recommended:—

Gold Medal.

To Mr. Amos Perry, Enfield, for aquatic plants and ferns.

Banksian Medal.

To Messrs. Hollamby, Groombridge, for *Pyracanthas* and *Clematis*.

Award of Merit.

To *Fuchsia corymbiflora* as a greenhouse flowering plant (votes 13 for), from A. J. Cobb, Esq., Reading. A handsome tender shrub. The large, broad leaves are thick and of a rich deep green. The pendent, terminal inflorescences bear very numerous, long-tubed, crimson flowers.

To *Gentiana prolata* as a flowering plant for the rock garden or alpine house (votes unanimous), from Andrew Harley, Esq., Dollar, Perthshire. A very dainty species. The slender spreading stems are covered with small, lanceolate leaves, and the flowers are borne singly. The tube is pale, the spreading, pointed corolla-lobes bright sky-blue.

To *Pinguicula gypsicola* as a tender flowering plant (votes 7 for, 3 against), from the Director, Royal Botanic Gardens, Kew. A Mexican species, similar in appearance to the British Butterwort, but with larger violet flowers well displayed above the flat, pale green rosette of foliage.

Other Exhibits.

Roger Bevan, Esq., Henley: *Erythraea venusta*, *Campanula mollis*, *C. fragilis*.

A. J. Cobb, Esq., Reading: *Fuchsia fulgens*.

Messrs. Elliott, Stevenage: *Oxalis geminata*, C. E. 228.

The Hon. Vicary Gibbs, Elstree: *Pyrus* 'Aldenham Purple.'

Messrs. Veitch, Exeter: shrubs.

FLORAL COMMITTEE, AUGUST 27, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and thirteen other members present.

Awards Recommended:—*Silver Banksian Medal.*

To Messrs. Engelmann, Saffron Walden, for Carnations.
 To Mr. Hemsley, Crawley, for Dahlias and Sidalceas.
 To Mr. J. H. Pemberton, Havering, for Roses.
 To Messrs. Redgrove, Borough Green, for herbaceous plants.
 To Messrs. Stredwick, St. Leonards-on-Sea, for Dahlias.
 To Messrs. Sutton, Reading, for Annual Asters.

Banksian Medal.

To Messrs. Allen, Norwich, for Roses.
 To Messrs. Allwood, Haywards Heath, for Carnations.
 To Messrs. Bide, Farnham, for Sweet Peas.
 To Messrs. B. R. Cant, Colchester, for Roses.
 To Mr. A. Dawkins, Chelsea, for Marigolds.
 To Mr. S. J. Goodliffe, Bishop's Stortford, for herbaceous plants.
 To Messrs. Langridge, Westerham, for Dahlias.
 To Mr. A. Miles, Bromley, for herbaceous plants.

Award of Merit.

To Chrysanthemum 'Winnie Avery' for cutting and market (votes unanimous), from Mr. C. T. Kipping, Althorne. A light golden-bronze decorative variety of good form.

The following plants received awards after trial at Wisley:—

Award of Merit.

To Gladiolus 'Adoration' from Messrs. Velthuys, Hillegom, Holland. Height $3\frac{1}{2}$ feet, unbranched, with eighteen closely set flowers, five or six out at a time; flowers 4 inches diameter, deep scarlet, lower petals lined cream, substance stout. Flowering from August 8. Large-flowered.

To Gladiolus 'Capt. Boynton' from Messrs. Velthuys, Hillegom. Height $4\frac{1}{2}$ feet, branched, with twenty closely set flowers, four out at a time; flowers $4\frac{1}{2}$ inches diameter, pale rosy-lilac, lower petals blotched magenta on cream, somewhat hooded, substance soft. Flowering from August 3. Large-flowered.

To Gladiolus 'Emma' from Messrs. Velthuys, Hillegom. Height $3\frac{1}{2}$ feet, branched, with eighteen closely set flowers, four or five out at a time; flowers $4\frac{1}{2}$ inches diameter, bright rosy-carmine, lower petals blotched crimson, hooded, substance soft. Flowering from July 28. Large-flowered.

To Gladiolus 'Gladness' from Messrs. Velthuys, Hillegom. Height $3\frac{1}{2}$ feet, unbranched, with eighteen to twenty closely set flowers, four or five out at a time; flowers $3\frac{1}{2}$ inches diameter, glowing scarlet self, somewhat hooded, substance soft. Flowering from July 28. Large-flowered.

To Gladiolus 'Harmony' from Messrs. Velthuys, Hillegom. Height $3\frac{3}{4}$ feet, branched, with sixteen to eighteen closely set flowers, six or seven out at a time; flowers 4 inches diameter, hooded, soft cream-pink, substance stout. Flowering from August 8. Large-flowered.

To Gladiolus 'Mrs. Unwin' from Messrs. Velthuys, Hillegom. Height 3 feet, branched, with eighteen closely set flowers, six out at a time; flowers 5 inches diameter, clear rose-pink, lined magenta at the throat, substance stout. Flowering from August 19. Large-flowered.

To Helenium 'Wyndley' from Messrs. Carter Page, London. Plant vigorous, 24 inches high, of compact bushy habit, foliage dark green; flowers $2\frac{1}{2}$ inches diameter, single, golden-yellow tinged with scarlet, disc 1 inch diameter, dark brownish. Flowering freely.

To Larkspur 'Exquisite Pink Improved' from the Waller Franklin Seed Co., Guadalupe, California. Plant 4 feet, branching freely; flower spikes 9 to 12 inches in length; flowers $1\frac{1}{2}$ inch diameter, semi-double, rosy-pink, flatter and more loosely arranged than those of 'Exquisite Rose.' A true even stock.

To Larkspur 'Exquisite Rose' from the Waller-Franklin Seed Co., Guadalupe, California. Very similar to the preceding variety, but flowers of a dark shade

and closer placed, with curled petals giving a fringed effect to the flower. A true even stock.

To Larkspur 'La France' from Messrs. Bodger, Los Angeles, California. Flowering from July 30, 1929. Plant 5 feet, branching freely; flower spikes 9 to 12 inches in length; flowers $1\frac{1}{2}$ inch diameter, flat, semi-double, bright pale pinkish-carmine; petals broad and full. Flowering very freely. A true stock.

Highly Commended.

To Gladiolus 'La Gaieté' from Messrs. Velthuys, Hillegom, Holland. $5\frac{1}{2}$ feet, branched, with fourteen closely set flowers, four out at a time; flowers 4 inches diameter, rich rosy-carmine, margins flaked magenta, lower petals crimson, substance flimsy. Flowering from August 12. Large-flowered.

To Gladiolus 'Ne Plus Ultra' from Messrs. Velthuys, Hillegom. 4 feet, branched, with eighteen to twenty closely set flowers, seven to eight out at a time; flowers 4 inches diameter, white flaked rose at margins, throat creamy-white, substance soft. Flowering from August 10. Large-flowered.

To Gladiolus 'The Queen' from Messrs. Velthuys, Hillegom. $5\frac{1}{2}$ feet, unbranched, with fourteen closely set flowers, four out at a time; flowers $3\frac{1}{2}$ inches diameter, pale rose-pink, throat blotched scarlet, substance soft. Flowering from July 28. Large-flowered.

To Godetia 'Tall Double Cherry Red' from Messrs. Sutton, Reading. Plant $2\frac{1}{2}$ feet tall, branching from the base with erect central stem, pyramidal in form; flowers semi-double, $2\frac{1}{2}$ to $2\frac{1}{2}$ inches diameter, rich deep rosy-red. Flowering from July 22. Contained one double-flowered pink rogue.

The awards recommended to Fuchsias on trial at Wisley were confirmed.

The following Dahlias were selected by the Joint Dahlia Committee for trial at Wisley :—

From Messrs. Stredwick, St. Leonards-on-Sea : 'Charles A.' (Dec.), 'Daily Mail' (Dec.), 'Magician' (Dec.).

Other Exhibits.

Mr. J. H. Burgess, Edmonton : Asters.

Misses Hopkins, Coulsdon : herbaceous plants.

Mr. W. R. McCracken, Long Eaton : Carnation 'Dr. Bland.'

Mr. J. Parkin, Wigton : seedling Carnation.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and eight other members present.

Awards Recommended :—

Silver Banksian Medal.

To Mr. R. C. Notcutt, Woodbridge, for flowering shrubs.

Banksian Medal.

To Messrs. Hollamby, Groombridge, for Pyracanthas and Clematis.

Award of Merit.

To *Crassula sarcocaulis* as a half-hardy flowering plant (votes 7 for, 1 against), from the Director, R.H.S. Gardens, Wisley. A rather uncommon species useful for the alpine house. From a shrubby base are produced short branches bearing narrow glaucous leaves and terminal bunches of flowers. These are tubular, expanded at the end of the corolla, pink within and reddish on the outside of the tube.

To *Hedychium Gardinerianum* as a greenhouse flowering plant (votes 6 for, 1 against), from F. Kemp, Esq., Haywards Heath. The specimen exhibited was extremely well developed, bearing an inflorescence 16 inches long. The flowers are yellow with protruding red stamens and are closely and very regularly arranged on the axis.

Other Exhibits.

Andrew Harley, Esq., Dollar, Perthshire : *Gentiana corymbiflora*.

Sir John Ramsden, Bt., Gerrard's Cross : *Lilium Henryi*.

The Director, R.H.S. Gardens, Wisley : *Rosa haematodes*, *R. cinnamomea*.

FLORAL COMMITTEE, SEPTEMBER 10, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and fourteen other members present.

Awards Recommended :—*Silver-gilt Banksian Medal.*

- To Messrs. Barr, Taplow, for Montbretias, Asters, Lilies.
- To Messrs. Bath, Wisbech, for Gladioli.
- To Messrs. Kelway, Langport, for Gladioli.
- To Messrs. Carter Page, London, for Dahlias.

Silver Banksian Medal.

- To Messrs. Dobbie, Edinburgh, for Zinnias and Marigolds.
- To Messrs. Dobbie, Edinburgh, for Gladioli and Sweet Peas.
- To Messrs. Engelmann, Saffron Walden, for Carnations.
- To Mr. J. H. Pemberton, Havering, for Roses.
- To Messrs. Prior, Colchester, for Roses.
- To Messrs. Wheatcroft, Gedling, for Roses.

Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
- To Messrs. B. R. Cant, Colchester, for Roses.
- To Messrs. Daniels, Norwich, for Gaillardias and Gladioli.
- To Mr. J. Golding, Fordham, for Scabious.
- To Mr. S. J. Goodliffe, Bishop's Stortford, for Dahlias, etc.
- To Mr. H. Hemsley, Crawley, for Dahlias.
- To Messrs. Hewitt, Solihull, for Delphiniums.
- To Messrs. Ladhams, Southampton, for herbaceous plants.
- To Messrs. Langridge, Westerham, for Dahlias and Gladioli.
- To Mr. Amos Perry, Enfield, for herbaceous plants.
- To Mr. H. Prins, Wisbech, for Gladioli.
- To Messrs. Redgrove, Borough Green, for herbaceous plants.
- To Messrs. Vert, Saffron Walden, for Hollyhocks.

Selected for trial at Wisley.

Helenium 'Chipperfield Orange' from Messrs. Simmonds, King's Langley.

The following Dahlias were selected by the Joint Dahlia Committee :—

- From Messrs. Cheal, Crawley :
'Bhopal' (Min. Pæony), 'Darjeeling' (Min. Pæony), 'Faygate Star' (Star), 'Schneider' (Min. Pæony), 'Tunis' (Pom.).
- From Mr. A. J. Cobb, Reading :
'The Rancee' (Min. Pæony).

Other Exhibits.

- Misses Hopkins, Coulsdon : herbaceous plants.
- Mr. E. Knight, Clacton : Dahlia 'Sunny Clacton.'
- Mr. A. Miles, Bromley : herbaceous plants.
- Mr. S. Pye, Garstang : Dahlias.
- Mr. H. Shoesmith, Jun., Woking : Chrysanthemums.
- Mr. A. W. Thorpe, Lichfield : Chrysanthemums.
- Messrs. Wood, Taplow : Dahlias.
- Mr. H. Woolman, Birmingham : Chrysanthemums.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and ten other members present.

Awards Recommended :—*Gold Medal.*

- To The Hon. Vicary Gibbs, Elstree, for Pelargoniums.

Banksian Medal.

To Messrs. Hollamby, Groombridge, for climbing plants.
To Messrs. Maxwell & Beale, Broadstone, for Heaths.
To Messrs. Russell, Richmond, for stove plants.
To Messrs. Veitch, Exeter, for shrubs.

Award of Merit.

To *Calluna vulgaris flore pleno* as a hardy flowering shrub (votes 8 for, 2 against), from Messrs. Maxwell & Beale, Broadstone. There are several varieties of double-flowered Heather: the one shown on this occasion is of superior merit, and distinguished by the exhibitor under the name 'H. E. Beale.'

To *Ixora lutea* as a greenhouse flowering plant (votes 7 for), from Messrs. Russell, Richmond. A handsome shrubby species bearing opposite, oblong-elliptic leaves and dense corymbs of bright yellow flowers. These are long-tubed, with four spreading corolla-lobes and conspicuous red anthers.

To *Lilium philippinense formosanum* Price's form as a hardy flowering plant (votes 8 for, 1 against), from E. M. Preston, Esq., Hayes. A tall, slender Lily with narrow lanceolate leaves and several large flowers. The perianth is long and narrowly funnel-shaped, opening widely at the mouth. The segments are milk-white, marked with longitudinal reddish stripes on the exterior.

To *Penstemon antirrhinoides* as a tender flowering shrub (votes 6 for, 1 against), from the Director, John Innes Hort. Inst., Merton. A small Californian shrub which needs the protection of a wall. The opposite leaves are ovate and acuminate, and the flowers appear singly at the ends of short lateral growths. They are bright yellow—an unusual colour in this genus.

To *Pernettya leucocarpa* as an ornamental-fruited hardy shrub (votes 8 for), from Lt.-Col. L. C. R. Messel, O.B.E., Handcross. This is a prostrate shrub reaching a height of about one foot. It is clothed with small, entire leaves, and produces clusters of white fruits.

To *Xanthosoma violaceum* as a greenhouse flowering aquatic (votes 7 for), from Mr. Amos Perry, Enfield. A tender West Indian Aroid. The leaves are sagittate on long violet petioles which, like the inflorescence-stalks, afford brilliant contrast to the long yellow spathe.

Other Exhibits.

E. E. Holt Evans, Esq., Fleet: *Oenothera* sp.

The Director, John Innes Hort. Inst., Merton: *Antirrhinum glandulosum*, *Penstemon cordifolius*, *P. centranthifolius*.

Sir Wm. Lawrence, Bt., Burford: *Salvia Pitcheri*, *Calceolaria integrifolia*, *Spathiphyllum* sp.

DAHLIA SHOW, SEPTEMBER 11, 1929.

The following Dahlias were selected by the Joint Committee for trial at Wisley:—

From Messrs. Ballego, Leiden, Holland:

'Frau O. Bracht' (Cactus), 'Katherine Valentine Smith' (Cactus).

From Messrs. Burrell, Cambridge:

'Claret' (Small Dec.), 'Dora' (Charm), 'Glint' (Charm), 'Lurid' (Charm), 'Senley' (Charm).

From Messrs. Stredwick, St. Leonards-on-Sea:

'Avis Cowdrey' (Dec.), 'Jamboree' (Dec.), 'Laconia' (Dec.).

From Messrs. Topsvoort, Aalsmeer, Holland:

'Mrs. A. Breuls' (Dec.).

From Messrs. Treseder, Cardiff:

'Florence M. Davies' (Dec.).

Dahlias were also submitted by the following:—

Messrs. Bruidegom, Baarn, Holland.

Messrs. Carlée, Haarlem, Holland.

Messrs. Kroon, Baarn, Holland.

Dr. K. Maarsen, Aalsmeer, Holland.

Mr. C. Turner, Slough.

Messrs. Vanderschoot, Hillegom, Holland.

Mr. H. Woolman, Birmingham.

FLORAL COMMITTEE, SEPTEMBER 19, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and fifteen other members present.

Awards Recommended :—

Award of Merit.

To Chrysanthemum 'Kingcup' for cutting and market (votes unanimous), from Mr. H. Shoemith, Jun., Woking. A useful decorative variety with small rich yellow flowers borne in sprays on thin wiry stems.

To Chrysanthemum 'Mrs. W. D. Cartwright' for cutting and market (votes unanimous), from Mr. H. Shoemith, Jun., Woking. A slightly incurved decorative variety of bright yellow colour and good form.

Selected for trial at Wisley.

Aster 'Bessie Chapman' from Mr. T. Bones, Cheshunt.

Aster 'Gayborder Blue' from the Gayborder Nurseries, Melbourne, Derbyshire.

Aster 'Mrs. Gladys Forbes' from Mr. T. Bones, Cheshunt.

Aster 'Pink Pearl' from Mr. E. Ballard, Colwall.

The following Dahlias were selected by the Joint Dahlia Committee :—

From Messrs. Burrell, Cambridge :

'Eda' (Charm), 'Pauline' (Charm).

From Messrs. Cheal, Crawley :

'Hadley' (Star), 'Margate Star' (Star), 'Mysore' (Min. Pæony), 'Nagpur' (Camellia-fl.).

From Messrs. Stredwick, St. Leonards-on-Sea :

'Emulation' (Dec.), 'Rebel' (Cactus), 'W. F. Balding' (Dec.).

Other Exhibits.

Mr. A. J. Cobb, Reading : Dahlias.

Mr. H. B. Elling, Rustington : Chrysanthemum 'Paul Elling.'

Messrs. McGredy, Portadown : Roses 'Cherry' and 'McGredy's Ivory.'

Mr. E. Poole, Prees : seedling Chrysanthemum.

Messrs. Reeves, Norwich : Rose 'Little Dorrit.'

Messrs. Treseder, Cardiff : Dahlias.

Messrs. Wood, Taplow : Dahlias.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—

Award of Merit.

To *Lapeyrousia grandiflora* as a flowering plant for the cool greenhouse (votes unanimous), from Mr. Amos Perry, Enfield. A brilliant Irid introduced from the Zambesi district in 1858. The second scapes are 4-10-flowered, the flowers bright brownish-scarlet, the lower segments blotched with crimson. The white tube is 1½ inch long.

Other Exhibits.

Messrs. Holdforth, Woking : *Erica Searlii aurea*.

Mr. Amos Perry, Enfield : *Liatris graminifolia*, *L. punctata*, *Nerine filiformis*, *Cyperus Braunii*, *C. paramattensis*, *Petalostemon purpureum*.

FLORAL COMMITTEE, OCTOBER 2, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen other members present.

Awards Recommended :—

Award of Merit.

To Chrysanthemum 'Lido' for cutting and market (votes 10 for), from Mr. H. Shoesmith, Jun., Mayford, Woking. A medium-sized golden-bronze decorative variety tipped with yellow.

To Chrysanthemum 'Mrs. Sarah Knight' for cutting and market (votes unanimous), from Mr. H. Shoesmith, Jun., Mayford, Woking. A large flat rose-pink decorative variety with a silvery reverse. It is of good substance and should prove very valuable for market work.

Selected for trial at Wisley.

Aster 'Pink Nymph' from Messrs. Wood, Taplow.

Aster 'Rosemary' from Messrs. Burkwood & Skipwith, Kingston.

The following Dahlias were selected by the Joint Dahlia Committee :—

From Messrs. Burrell, Cambridge :

'Albion' (Charm), 'Cedric' (Charm), 'Edna' (Charm).

From Messrs. Cheal, Crawley :

'Bognor Star' (Star), 'Felbridge Star' (Star), 'Phyllis Wheaton' (Min. Pæony).

From Messrs. Wood, Taplow :

'Aurora' (Min. Pæony).

Other Exhibits.

Mr. T. Bones, Cheshunt : Aster 'Una.'

Mr. E. Knight, Clacton : Dahlia 'Sunny Clacton.'

Messrs. Prior, Colchester : Rose 'Golden Dawn.'

Messrs. Stredwick, St. Leonards-on-Sea : Dahlias.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and fifteen other members present.

Awards Recommended :—

Award of Merit.

To Ceanothus 'Autumnal Blue' as a hardy flowering shrub (votes 12 for), from Messrs. Burkwood & Skipwith, Kingston-on-Thames. A hybrid raised from the cross *C. thyrsiflorus* × *C. 'Indigo'*. It is a vigorous shrub not unlike the former parent in habit, with long, branched panicles of rich, dark blue flowers.

To *Cornus Mas* as a hardy, ornamental-fruited shrub (votes 8 for, 1 against), from the Curator, University Botanic Garden, Cambridge. The sprays exhibited were heavily laden with large, bright red fruits. Although *C. Mas* is not always so generous in its autumnal display, it is very attractive when, in early spring, it opens innumerable starry, yellow flowers.

Other Exhibits.

Messrs. Charlton & Sons, Rotherfield : *Crataegus glandulosa*, *Caryopteris tanguitica*.

Lady Rosamund Christie, Tapley : *Abutilon vexillarium*.

G. W. E. Loder, Esq., Ardingly : *Lagerstroemia indica*, *Euonymus yedoensis*, *Pilosagia viburnoides*.

The Director, R.H.S. Gardens, Wisley : *Elaeagnus umbellata*.

FLORAL COMMITTEE, OCTOBER 8, 1929.

Section A.

Mr. J. F. McLEOD in the Chair, and thirteen other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. J. B. Riding, Chingford, for Dahlias.

Silver Banksian Medal.

To Mr. T. Bones, Cheshunt, for Asters.

To Mr. J. W. Forsyth, Putteridge, for Chrysanthemums.

To Mr. J. T. West, Brentwood, for Dahlias.

Banksian Medal.

To Messrs. Cheal, Crawley, for Dahlias.

To The Gayborder Nurseries, Melbourne, for Asters.

To Messrs. Langridge, Westerham, for Dahlias.

To Messrs. Wood, Taplow, for Asters and Dahlias.

Award of Merit.

To Chrysanthemum 'Cavalier' for cutting and market (votes unanimous), from Mr. H. Shoesmith, Jun., Mayford, Woking. A rich reddish-bronze decorative variety tipped with yellow.

To Chrysanthemum 'Snowflake' for cutting and market (votes unanimous), from Mr. H. Shoesmith, Jun., Mayford, Woking. A useful decorative variety bearing its pure white flowers in sprays.

Selected for trial at Wisley.

Chrysanthemum 'Pink Prolific' from Mr. H. Shoesmith, Jun., Woking.

Dahlia 'Sunny Clacton' (Mignon) from Mr. E. Knight, Clacton.

Other Exhibits.

Mr. A. J. Cobb, Reading : Dahlia 'Faith Dutton.'

Misses Hopkins, Coulsdon : Aster 'Esther.'

Mr. H. G. Longford, Abingdon : Aster 'Mrs. M. E. Longford.'

Mrs. Roper, Chard : Salvias from India.

Mr. C. Turner, Slough : Dahlias.

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Section B.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—

Award of Merit.

To *Phaseolus Caracalla* as a greenhouse flowering plant (votes 7 for), from Mrs. Roper, Chard. This is an Indian species, long in cultivation but very uncommon. The leaves are like those of the garden Bean. The large flowers are ivory-white, flushed with yellow and marked with purple, and exhibit in a marked degree the spiral coiling of the keel peculiar to the genus. They are pleasantly scented.

To *Zephyranthes Atamasco* as a hardy flowering plant (votes 7 for), from Sir Wm. Lawrence, Bt., Burford. A well-known bulbous plant, first introduced in 1629 from Virginia. It flowers freely in a sheltered border or cold greenhouse, producing white blossoms with golden anthers and abundant dark green, linear foliage.

Other Exhibit.

Sir Wm. Lawrence, Bt., Burford : *Aphanoslephus Shirrobasia*.

VOL. LV.

FLORAL COMMITTEE, OCTOBER 23, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen other members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Engelmann, Saffron Walden, for Carnations.
To Mr. J. B. Riding, Chingford, for Dahlias.

Silver Flora Medal.

To Kingsacre Nurseries, Hereford, for Chrysanthemums.
To Messrs. Prior, Colchester, for Roses.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Dickson, Newtownards, for Roses.
To Messrs. S. Low, Enfield, for Carnations.
To Messrs. Luxford, Sawbridgeworth, for Chrysanthemums.
To Mr. J. H. Pemberton, Havering, for Roses.
To Mr. Amos Perry, Enfield, for herbaceous plants.
To Rolvenden Nurseries, Rolvenden, for Statics and Chrysanthemums.
To Messrs. Treseder, Cardiff, for Dahlias.
To Mr. A. G. Vinten, Balcombe, for Chrysanthemums.
To the Duke of Wellington (gr. Mr. H. J. Beckingham), Basingstoke, for Celosias and other plants.
To Messrs. Wheatcroft, Gedling, for Roses.

Banksian Medal.

To Messrs. Blackmore & Langdon, Bath, for Begonias and Cyclamen.
To Mr. R. J. Case, Taunton, for Pelargoniums.
To Messrs. Eveleens, Aalsmeer, Holland, for Cyclamen.
To Mr. G. Prince, Longworth, for Roses.

Award of Merit.

To Chrysanthemum 'Arabella' for cutting and market (votes 13 for, 3 against), from Mr. H. Shoesmith, Jun., Mayford, Woking. A deep rosy-mauve decorative variety of good form.

To Chrysanthemum 'Dazzle' for cutting (votes unanimous), from Mr. H. Shoesmith, Jun., Mayford, Woking. A very pleasing crimson Pompon variety producing quantities of freely flowered sprays.

To Chrysanthemum 'Florence Bigland' for cutting and market (votes unanimous), from Mr. H. Shoesmith, Jun., Mayford, Woking. A deep clear yellow decorative variety, slightly incurved at the centre.

To Chrysanthemum 'Mme. Gabrielle Thiaux' for show (votes unanimous), from Messrs. Luxford, Sawbridgeworth. This variety occurred as a sport some years ago in France. It is a large Japanese Chrysanthemum with long bright chestnut-red florets curled at the tips and having a golden reverse.

The following plant received an award after trial at Wisley :—

Award of Merit.

To Antirrhinum 'C. H. Herbert' from Messrs. W. H. Simpson, Birmingham. Plant 3½ feet tall, branching from the base; spikes long, compact; flowers large, old gold, tube begonia-rose shaded old gold. A very good even stock.

The awards recommended to Annual Asters and Dahlias on trial at Wisley were confirmed.

Other Exhibits.

Mr. H. A. Brown, Chingford : Fuchsias.
Mr. D. Chinn, Birmingham : Chrysanthemums.
Sir Basil Clarke, London : Chrysanthemum 'Winnie Camden.'
Messrs. Engelmann, Saffron Walden : Carnations 'Gladys' and 'Startler.'

Messrs. Fairbairn, Carlisle : Phloxes.
 Mr. W. Hall, Witley : Chrysanthemum 'Mrs. W. Hall.'
 Mr. J. J. Kettle, Corfe Mullen : Violets.
 C. W. Needham, Esq., Hale : Chrysanthemum 'Evelyn.'
 Mr. C. Turner, Slough : Dahlia 'Firefly.'
 Mr. G. Zambra, Dawlish : Violets.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and sixteen other members present.

Awards Recommended:—

Gold Medal.

To the Hon. Vicary Gibbs, Elstree, for shrubs.
 To Lionel de Rothschild, Esq., Exbury, for shrubs.
 To Messrs. Russell, Richmond, for stove plants.

Silver Flora Medal.

To Mr. T. M. Endean, Laindon, for Succulents.

Banksian Medal.

To the Countess Cawdor, Haslemere, for shrubs.

Award of Merit.

To *Euonymus laucifolius* as a hardy ornamental-fruited shrub (votes unanimous), from the Director, Royal Botanic Gardens, Kew. A handsome spindle-tree not unlike our native species. The specimens exhibited carried large numbers of pale rose fruits, most of which had split open, exposing scarlet seeds.

To *Cotoneaster multiflora callicarpa* as a hardy ornamental-fruited shrub (votes 8 for), from Sir Wm. Lawrence, Bt., Burford. A shrub of elegant habit. Its slender branches bear small, dark green, ovate leaves and clusters of white flowers in late spring. These are followed by numerous crimson fruits, larger than those of any other *Cotoneaster* we have seen.

To *Gladious Blackwellii* as a tender flowering plant (votes unanimous), from Collingwood Ingram, Esq., Benenden. This species bears long spikes of light mauve-pink flowers of medium size. It is remarkable for the long duration of the individual flowers, no fewer than twenty-four being fully expanded in the specimen shown.

To *Gordonia axillaris* as a tender flowering shrub (votes unanimous), from Major L. Johnston, Campden, Glos. A very striking plant producing large white flowers like single Camellias, and massive, dark green, narrow-oblong leaves. The flowers are axillary, solitary or paired.

To *Taxus baccata fructu-luteo* as a hardy ornamental-fruited shrub (votes unanimous), from the Director, Royal Botanic Gardens, Kew. A variety of the Yew with rich yellow-coloured fruits.

Other Exhibits.

Messrs. Cheal, Crawley : shrubs.
 Messrs. G. & A. Clark, Dover : shrubs.
 Lt.-Col. Stephenson R. Clarke, Haywards Heath : *Aralia chinensis glabrescens*,
Lilium myriophyllum superbum, *Ceratosigma Griffithii*.
 The Director, R.B.G., Kew : *Crataegus cordata*.
 Sir Wm. Lawrence, Bt., Burford : *Veronica Grahamii*.
 Mr. W. B. Le Grice, N. Walsham : shrubs.
 G. W. E. Loder, Esq., Ardingly : *Acanthopanax sichuanensis*, *Polygonum campanulatum*, *Eleutherococcus Henryi*.
 Mr. Amos Perry, Enfield : *Allionia linearis*, *Sienosiphon linifolium*, *Aster* sp.,
Nerina Bowdeni major.
 Messrs. Russell, Richmond : *Aphelandra tetragona*, *Amasonia punicea*,
Hedychium coronarium superbum.
 Mr. W. Wells, Jun., Merstham : *Arum* sp.

FLORAL COMMITTEE, NOVEMBER 5, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and fifteen other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. W. H. Walters, Cheltenham, for Nerines.

Silver Banksian Medal.

To Messrs. Engelmann, Saffron Walden, for Carnations.

To Messrs. Low, Enfield, for Carnations.

To Mr. J. H. Pemberton, Havering, for Roses.

To Mr. A. G. Vinten, Balcombe, for Chrysanthemums.

Other Exhibits.

Sir William G. Barber, Englefield Green : Chrysanthemums.

Messrs. Wheatcroft, Gedling : Roses.

Mr. G. Zambra, Dawlish : Violets.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and sixteen other members present.

Awards Recommended :—

Banksian Medal.

To Messrs. Baggesen, Pembury, for shrubs.

To the Countess Cawdor, Haslemere, for Hollies.

To Messrs. Russell, Richmond, for shrubs.

Other Exhibits.

The Hon. Vicary Gibbs, Elstree : *Pyrus toringoides*, *Sorbus domestica*, *Crataegus Dippeliana*.

The Misses Hopkins, Coulsdon : rock plants.

Lionel de Rothschild, Esq., Exbury : *Lonicera ligustrina yunnanensis*.

FLORAL COMMITTEE, NOVEMBER 19, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and ten other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. H. J. Jones, Lewisham, for Chrysanthemums.

To Messrs. S. Low, Enfield, for Carnations.

To J. Pierpont Morgan, Esq. (gr. Mr. F. A. Steward), Watford, for Begonias and Gesneras.

Silver Banksian Medal.

To Messrs. Luxford, Sawbridgeworth, for Chrysanthemums.

To The Rolvenden Nurseries, Rolvenden, for Chrysanthemums and Statice.

To Mr. A. G. Vinten, Balcombe, for Chrysanthemums.

Banksian Medal.

To Messrs. Blackmore & Langdon, Bath, for Cyclamen.

To Messrs. Engelmann, Saffron Walden, for Carnations.

Award of Merit.

To Chrysanthemum 'Chestnut' for cutting (votes 8 for), from Viscountess Byng of Vimy, Thorpe-le-Soken. An Anemone-flowered variety raised at the Experimental Farms, Ottawa, in 1926. The flowers are borne with great freedom in sprays and are of a light chestnut colour tinged with gold which shows to great advantage under artificial light.

To Chrysanthemum 'Hebe' for cutting and market (votes unanimous), from Mr. H. Shoesmith, Jun., Woking. A large rose-pink single variety with a silvery reverse and a narrow white zone round the disc.

To Chrysanthemum 'Sundown' for cutting and market (votes 8 for), from Mr. H. Woolman, Birmingham. A rich crimson single variety with several rows of florets. The flowers measure $4\frac{1}{2}$ inches across.

To Chrysanthemum 'Yellow Monument' for cutting and market (votes unanimous), from Mr. T. Stevenson, Hillingdon. A light yellow incurved variety of excellent form. It is a sport from the well-known white variety 'Monument.'

To Rose 'Autumn' for forcing, cutting, and market (votes 7 for, 2 against), from Messrs. Engelmann, Saffron Walden. A sweetly scented H.T. variety of medium size with rich apricot inner petals surrounded with deep rose outer petals. The flowers of this and the following variety were cut with very long stems in the U.S.A. on November 8, and conveyed to England in cold storage. They were both raised by Mr. L. B. Coddington, Murray Hill, New Jersey.

To Rose 'President Hoover' for forcing, cutting, and market (votes unanimous), from Messrs. Engelmann, Saffron Walden. A nicely scented H.T. variety with light apricot and pink inner petals. The outer petals are also pink but of a darker shade.

Other Exhibits.

F. Beer, Esq., Ivybridge : Chrysanthemum 'Miss E. A. Morris.'
Mr. G. Carpenter, Byfleet : Chrysanthemum 'Miss A. Goatley.'
Mr. J. E. Elliott, Netley Abbey : Chrysanthemum 'Dr. Arthur Peters.'
Mr. W. E. Field, Weybridge : Chrysanthemum 'Edward O. Bennett.'
Mr. C. Hodges, Tunbridge Wells : Chrysanthemums.
Mr. W. H. Parker, Worthing : Chrysanthemum 'Doris Parker.'
Mr. G. Zambra, Dawlish : Violets.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—*Silver Lindley Medal.*

To Messrs. Russell, Richmond, for *Nepenthes*.

Other Exhibits.

N. G. Hadden, Esq., West Porlock : *Cytisus* 'Porlock Seedling.'
The Misses Hopkins, Coulsdon : rock plants.
E. M. Preston, Esq., Hayes : *Stapelia gigantea*.
W. Van de Weyer, Esq., Dorchester : *Cyclamen Rohlfsianum*.

FLORAL COMMITTEE, DECEMBER 10, 1929.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—*Silver-gilt Banksian Medal.*

To Messrs. Luxford, Sawbridgeworth, for Chrysanthemums.
To S. Wallrock, Esq. (gr. Mr. W. H. Holloway), Stanmore, for Begonias.

Silver Banksian Medal.

To Messrs. Blom, London, for Azaleas, Cyclamen, and Begonias.
To Messrs. S. Low, Enfield, for Carnations.
To Mr. A. G. Vinten, Balcombe, for Chrysanthemums.

Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Engelmann, Saffron Walden, for Carnations.
To E. G. Hutton, Esq. (gr. Mr. J. Dines), Leatherhead, for Begonias.

Award of Merit.

To Chrysanthemum 'Balcombe Bronze' for cutting and market (votes 9 for), from Mr. A. G. Vinten, Balcombe. A very full-flowered decorative Chrysanthemum. The colour is deep bronze tipped with golden-yellow.

To Chrysanthemum 'Balcombe Sunray' for cutting and market (votes unanimous), from Mr. A. G. Vinten, Balcombe. A bright yellow decorative variety with light rosy tinting.

To Chrysanthemum 'Kenneth Hastie' for cutting and market (votes unanimous), from Mr. H. Shoesmith, Jun., Woking. A good bright crimson decorative variety with broad stiff florets lightly tipped with gold. The blooms are borne on wiry stems.

To Chrysanthemum 'Thanksgiving Pink' for cutting and market (votes unanimous), from Messrs. Luxford, Sawbridgeworth. A deep pink decorative variety of good type and size.

The awards recommended to Annual Gaillardias on trial at Wisley were confirmed.

Other Exhibits.

Mr. G. I. Adams, Tunbridge Wells : Chrysanthemum 'Lady Gerald Wesley.'
Mr. J. W. Fuller, Upper Norwood : Chrysanthemum 'Mrs. J. Hill.'
Mr. H. C. Gardner, Claygate : Chrysanthemum 'H. C. Gardner.'
Mr. I. Godber, Bedford : Chrysanthemums.
Mrs. E. M. Walrond, Cheshunt : Carnation 'Humphrey Charles Walrond.'

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and twenty-one other members present.

Awards Recommended :—

Banksian Medal.

To Messrs. Russell, Richmond, for shrubs.

Award of Merit.

To *Omphalogramma Souliei* as a flowering plant for the alpine house (votes unanimous), from Sir John Ramsden, Bt., Gerrard's Cross. This species received the Award of Merit, subject to naming, on April 23, 1929. The award was confirmed on this occasion. *O. Souliei* is a handsome species, bearing, in the specimen exhibited, a solitary, semi-erect flower somewhat resembling a Gloxinia, and produced before the leaves. The colour of the corolla is bright violet-blue, the tube paler and marked with creamy-white.

Other Exhibits.

Messrs. Baggesen, Pembury : Conifers.
Messrs. Barr, Covent Garden : *Helleborus niger altifolius*.
Misses Hopkins, Coulsdon : rock plants.
Mr. G. L. Knight, Brighton : *Stranvaesia undulata forma flava*.
Sir Wm. Lawrence, Bt., Burford : *Pyracantha crenulata* 'Coral Beads.'
Mrs. F. Tracy, Wimborne : *Vallea stipularis*.
Gurney Wilson, Esq., Hove : *Ornithogalum thyrsoides*.
Mr. G. E. P. Wood, Ashted : shrubs and rock plants.

FLORAL COMMITTEE, JANUARY 14, 1930.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Sir Gomer Berry, Bt. (gr. Mr. C. Poulter), Farnham Royal, for *Coleus thyrsoides*.

Banksian Medal.

To the Misses Allen-Brown, Henfield, for Violets.

To Messrs. Engelmann, Saffron Walden, for Carnations.

To Messrs. Low, Enfield, for Carnations.

Award of Merit.

To *Chrysanthemum* 'Gladys Pierson' for cutting and market (votes unanimous), from Messrs. Luxford, Sawbridgeworth. A good, late, golden-amber decorative variety of excellent form.

Other Exhibits.

The Misses Hopkins, Coulsdon : Violets, etc.

Messrs. Sutton, Reading : Cyclamen 'Unique.'

Mr. G. Zambra, Dawlish : Violets.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, sixteen other members and Viscountess BYNG OF VIMY (visitor) present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Gill, Falmouth, for Rhododendrons and Camellias.

Banksian Medal.

To Messrs. Barr, Taplow, for bulbs and rock plants.

To Messrs. Cutbush, Barnet, for shrubs.

To Messrs. Russell, Richmond, for shrubs.

First-class Certificate.

To *Euphorbia fulgens* as a flowering plant for the stove (votes unanimous), from Lionel de Rothschild, Esq., Exbury. A small shrub with slender, spreading branches. The long-petioled, lanceolate leaves are dark green and afford strong contrast to the vivid orange-scarlet cyathia. These resemble small, five-petalled flowers and are borne in dense, axillary clusters. *E. fulgens* is synonymous with *E. jacquiniaeflora*.

Award of Merit.

To *Luculia Pinciana* as a flowering shrub for the cool greenhouse (votes unanimous), from Lionel de Rothschild, Esq. A spreading shrub with large oval dark green leaves arranged in opposite pairs. The flowers are carried in an immense compound cyme and exhale a delicious scent. The individual flower is tubular with flattened corolla-limb $1\frac{1}{2}$ inch across, creamy-white flushed with pale pink, the tube rose-coloured.

Certificate of Cultural Commendation.

To A. J. Cobb, Esq., Reading, for *Fuchsia corymbiflora*. This species received the A.M. in August 1929. The massive flowering sprays exhibited on the present occasion were cut from plants six months old from seed.

Other Exhibits.

Lady Aberconway and the Hon. D. H. McLaren, Bodnant : *Narcissus aureus*,
Sarcococca ruscifolia, *Stranvaesia undulata fructu luteo*.
 Messrs. Baggesen, Pembury : shrubs.
 J. J. Joicey, Esq., Witley : *Reichsteinera tuberosa*.
 Messrs. Low, Enfield : shrubs.
 The Orpington Nursery Co., Orpington : shrubs.
 Mr. P. S. Patrick, Sevenoaks : shrubs.
 Lionel de Rothschild, Esq., Exbury : *Ilex cornuta*.
 Mr. G. E. P. Wood, Ashted ; shrubs.

FLORAL COMMITTEE, JANUARY 28, 1930.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
 To Messrs. Cuthbert, Southgate, for Hyacinths.

Banksian Medal.

To Messrs. Engelmann, Saffron Walden, for Carnations.
 To Messrs. Low, Enfield, for Carnations.

Award of Merit.

To Carnation 'White Senator' for exhibition, cutting, and market (votes unanimous), from Messrs. Allwood, Haywards Heath. A sweetly scented perpetual-flowering variety of American origin, with large pure white flowers of good form.

Other Exhibit.

Messrs. H. Chapman, Rye : Freesia 'Parma.'

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and sixteen other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Prichard, Christchurch, for shrubs and rock plants.

Banksian Medal.

To Messrs. Barr, Covent Garden, for bulbous plants.
 To Messrs. Blom, Wigmore Street, W. 1, for Azaleas.
 To Messrs. Cutbush, Barnet, for shrubs and rock plants.
 To Messrs. Gill, Falmouth, for Rhododendrons.
 To Messrs. Russell, Richmond, for shrubs.
 To Messrs. Waterer, Bagshot, for shrubs and rock plants.
 To Messrs. Wood, Taplow, for shrubs and rock plants.

Other Exhibits.

The Misses Hopkins, Coulsdon : rock plants.
 Messrs. S. Low, Enfield : shrubs.
 Mr. R. C. Notcutt, Woodbridge : *Pyrus floribunda*, Rose Hill variety.
 The Orpington Nursery Co., Orpington : shrubs.
 Mr. P. S. Patrick, Sevenoaks : shrubs and rock plants.
 Messrs. Pulham, Bishop's Stortford : shrubs and rock plants.

FLORAL COMMITTEE, FEBRUARY 11, 1930.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and sixteen other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Blackmore & Langdon, Bath, for Cyclamen.
To E. Hulton, Esq. (gr. Mr. J. Dines), Leatherhead, for Cyclamen.
To Messrs. Sutton, Reading, for flowering bulbs.

Silver Banksian Medal.

To Messrs. S. Low, Enfield, for Cyclamen and Carnations.
To St. George's Nursery Co., Harlington, for Cyclamen.

Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Carter, Raynes Park, for *Primula malacoides*.
To Messrs. Engelmann, Saffron Walden, for Carnations.
To E. H. Loyd, Esq. (gr. Mr. W. R. Neal), King's Langley, for Cyclamen.

Other Exhibits.

Messrs. Barr, Taplow : *Lachenalia pendula superba* and five forms of *Helleborus orientalis*.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and seventeen other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Barr, Taplow, for shrubs and bulbous plants.

Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs and bulbous plants.
To Messrs. Cutbush, Barnet, for shrubs.
To Messrs. Elliott, Stevenage, for alpine plants.
To Messrs. Gill, Falmouth, for Rhododendrons and Anemones.
To Messrs. Prichard, Christchurch, for shrubs and bulbous plants.
To Messrs. Russell, Richmond, for shrubs and greenhouse plants.
To Messrs. Tucker, Oxford, for alpine plants.
To Messrs. Wallace, Tunbridge Wells, for shrubs and bulbous plants.
To Messrs. Waterer, Bagshot, for shrubs and bulbous plants.
To Messrs. Wood, Taplow, for shrubs and rock plants.

Award of Merit.

To *Chorizema varium* as a tender flowering shrub (votes 11 for, 1 against), from E. M. Preston, Esq., Hayes. This species closely resembles the better-known *C. cordatum*, but is of erect habit and differs in the shape of its leaves. The small orange and pink flowers are freely produced.

To *Erica carnea* 'Springwood White' as a hardy flowering shrub (votes unanimous), from the Director, R.H.S. Gardens, Wisley. A very fine white form of the most popular of hardy heaths. It was collected on the slopes of Monte Correggio, and forms a spreading floriferous bush about 8 inches in height.

Certificate of Cultural Commendation.

To Mr. C. F. Wood, gardener to E. M. Preston, Esq., Hayes, for *Begonia manicata*.

Other Exhibits.

Messrs. Baggesen, Tunbridge Wells : shrubs.
Messrs. Baker, Codsall : shrubs and bulbous plants.
The Lye Green Nurseries, Chesham : shrubs.

The Rev. H. Rollo Meyer, Hertford : Irises.
 The Orpington Nursery Co., Orpington : shrubs.
 Mr. P. S. Patrick, Sevenoaks : shrubs.
 E. M. Preston, Esq., Hayes : Camellia 'Apple Blossom,' *Daphne cannabina*,
Kunzea opposita.
 Messrs. Prichard, Christchurch : Saxifraga 'His Majesty.'
 Messrs. Pulham, Bishop's Stortford : shrubs and rock plants.
 J. Cromar Watt, Esq., Aberdeen : *Galanthus Elwesii* var.
 Mr. G. E. Welch, Cambridge : alpine plants.
 Mr. G. E. P. Wood, Ashted : shrubs.

FLORAL COMMITTEE, FEBRUARY 25, 1930.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and fifteen other members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sutton, Reading, for Cyclamen.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
 To the University of Reading, Reading, for Cinerarias.

Banksian Medal.

To Messrs. Engelmann, Saffron Walden, for Carnations.
 To Messrs. S. Low, Enfield, for Carnations, Cyclamen, etc.

Award of Merit.

To Carnation 'Allwood's Prolific' for cutting and market (votes 11 for), from Messrs. Allwood, Haywards Heath. A perpetual-flowering variety with deep flesh-pink flowers of good form and medium size borne on stiff wiry stems. It is a seedling from 'Wivelsfield White' and is very free-flowering. The colour is good under artificial light.

Other Exhibit.

J. W. Jones, Esq., Trowbridge : Freesia seedlings.

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Section B.

Mr. C. T. MUSGRAVE, V.M.H., in the Chair, and nineteen other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Barr, Taplow, for bulbs and alpine plants.
 To Messrs. Elliott, Stevenage, for alpine plants.
 To Messrs. Russell, Richmond, for flowering plants.

Banksian Medal.

To Messrs. Cheal, Crawley, for flowering shrubs.
 To the Rev. H. R. Meyer, Hertford, for Irises.
 To Mr. G. Reuthe, Keston, for shrubs.
 To Messrs. Tucker, Oxford, for alpine plants.
 To Messrs. Veitch, Exeter, for flowering shrubs.
 To Messrs. Wallace, Tunbridge Wells, for flowering shrubs.
 To Mr. G. E. Welch, Cambridge, for alpine plants.

Award of Merit.

To *Helleborus lividus* as a hardy flowering plant (votes unanimous), from G. P. Baker, Esq., Sevenoaks. Shown as *H. corsicus*. A robust evergreen plant with dark green trifoliate leaves. The leaflets are coriaceous and coarsely toothed. The yellowish-green flowers are borne in terminal cymes.

To *Rhododendron* 'Sir George Holford' as a greenhouse flowering shrub (votes unanimous), from the Earl of Morley, Westonbirt. The young plant shown bore one large terminal truss of widely expanded orange-yellow flowers, slightly shaded with red on the margin of the corolla. Apparently a hybrid of *R. javanicum* parentage, remarkable for its brilliant colouring.

Other Exhibits.

- Messrs. Baker, Codsall : shrubs and rock plants.
- Mr. G. Hemsley, Crawley : shrubs and rock plants.
- The Misses Hopkins, Coulsdon : rock plants.
- Major L. Johnston, Campden : *Watsonia aletroides*, *Sparaxis* sp.
- Sir Wm. Lawrence, Bt., Burford : *Echium candicans*.
- The Lye Green Nurseries, Chesham : shrubs.
- Gus Meyer, Esq., Woldingham : Azalea 'Albert and Elizabeth.'
- The Orpington Nurseries, Ltd., Orpington : shrubs and rock plants.
- Mr. P. S. Patrick, Sevenoaks : shrubs and rock plants.
- Messrs. Pulham, Bishop's Stortford : shrubs and rock plants.
- Messrs. Redgrove, Borough Green : shrubs and rock plants.
- Messrs. Russell, Richmond : *Hoffmannia Griesbreghtii*, *Cinnamomum Tamala*.
- Messrs. Sutton, Reading : *Cyclamen persicum* forma.
- Messrs. Tucker, Oxford : *Saxifraga Burseriana crenata lutea*.
- Mr. G. E. P. Wood, Ashted : shrubs and rock plants.

ORCHID COMMITTEE.

DECEMBER 11, 1928.

Sir JEREMIAN COLMAN, Bt., in the Chair, and fifteen other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To S. G. Brown, Esq., Brownlands, Shepperton, for a group.
To Messrs. Alexander, Tetbury, Glos., for *Cypripediums*.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for winter-flowering hybrids.
To Messrs. Cowan, Southgate, N., for a group.
To Messrs. Sanders, St. Albans, for species and hybrids.

Banksian Medal.

To Mr. T. Bones, Cheshunt, for group of *Cypripedium insigne* and *C. × Leeanum*.

First-class Certificate.

To *Laeliocattleya × 'Aconcagua,'* Dell Park var. (*L.-c. × Schroederæ × C. × 'Maggie Raphael'*) (votes 12 for, 2 against), from Baron Bruno Schröder, Englefield Green, Surrey. A large flower with broad segments, sepals and petals white, labellum purple round the margin and golden yellow in the throat.

To *Odontoglossum × 'Eldorado,'* Claygate Lodge var. (*eximium × Lakiniae*) (votes 13 for), from the Exors. of the late Mr. J. J. Bolton, Claygate, Surrey. Flowers unusually large, white with reddish spotting on the segments, the petals with a well-defined line of spotting near the margin.

Award of Merit.

To *Pottinara × 'Royal Purple' var. 'The Node' (B.-l.-c. × 'Gerald' × S.-c. × westfieldensis)* (votes 13 for), from Mrs. Carl Holmes, The Node, Welwyn, Herts. Flower of medium size, intense crimson-purple, labellum ruby-crimson.

To *Brassolaeliocattleya × 'Priapus,'* Brockhurst var. (*L.-c. × 'Carmencita' × B.-l.-c. × 'Tucuman'*) (votes 14 for), from F. J. Hanbury, Esq., Brockhurst, East Grinstead. Flower orange-yellow, labellum marked with cerise and gold venation in the throat.

To *Odontoglossum × 'Purple Empress' ('Doreen' × 'Purple Emperor')* (votes 11 for), from F. J. Hanbury, Esq. Flowers of almost solid claret-purple, petals with slight white markings near the margin, labellum bordered with white.

To *Brassolaeliocattleya × 'Aprica' var. 'Aureole' (L.-c. × 'Ixion' × B.-l.-c. × 'The Baroness')* (votes 11 for, 1 against), from Messrs. Charlesworth. Flower of thick texture, yellow, with light cerise on the front of the labellum.

To *Cypripedium × 'Grace Darling'* (parentage unrecorded) (votes 11 for), from Messrs. Black & Flory, Slough. A pleasing hybrid of delicate colouring. Dorsal sepal whitish with light greenish base, the drooping petals greenish with obscure veining.

Cultural Commendation.

To Mr. F. W. Thurgood, Orchid grower to S. G. Brown, Esq., Shepperton, for *Zygopetalum intermedium*, with four spikes having a total of twenty-five flowers and one spike of six buds.

Other Exhibits.

Messrs. Stuart Low, Jarvis Brook, Sussex : various species and hybrids.

Mr. Harry Dixon, Wandsworth Common : hybrid *Cypripediums*.

Lionel de Rothschild, Esq., Exbury : *Odontoglossum × 'Omega,'* with a branching spike of bright purplish flowers.

Messrs. Black & Flory : *Cypripedium × 'Thrums'* and *C. × 'Symphony.'*

Robert Paterson, Esq., Ardingly, Sussex : *Cypripedium × 'Prince Albert.'*

Baron Bruno Schröder : two fine varieties of *Laeliocattleya × 'Aconcagua.'*

ORCHID COMMITTEE, JANUARY 15, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen other members present.

Awards Recommended :—

Gold Medal.

To Miss A. B. Moore, Chardwar, Bourton-on-the-Water, Glos., for *Cypripediums*.

To Messrs. Charlesworth, Haywards Heath, for species and hybrids.

To Messrs. McBean, Cooksbridge, Sussex, for various hybrids.

Silver Banksian Medal.

To Messrs. Sanders, St. Albans, for species and hybrids.

Banksian Medal.

To S. G. Brown, Esq., Shepperton, for group.

To Messrs. Cowan, Southgate, N., for group of *Cypripediums*.

To Mr. J. Evans, Colwyn Bay, for group of *Cypripediums*.

To Messrs. Cypher, Cheltenham, for group of *Cypripediums*.

First-class Certificate.

To *Cypripedium* × 'Strombole' ('Nubia' × 'Gaston Bultel') (votes unanimous), from Baron Bruno Schröder, Englefield Green, Surrey. A handsome flower with round dorsal sepal, deep crimson, with a narrow white margin, the central area marked with vertical lines of dark purplish red; labellum and petals reddish-brown.

To *Cymbidium* × 'Albania' (*albanense* × *Alexanderi*) (votes unanimous), from Mrs. Carl Holmes, The Node, Welwyn, Herts. The plant bore an erect spike of eight flowers, light rose-pink, the labellum crimson-red spotted with dark red.

Award of Merit.

To *Cypripedium* × 'Jungfrau,' Brockhurst var. ('Miss Audrey Locke' × 'Christopher') (votes 9 for), from F. J. Hanbury, Esq., Brockhurst, East Grinstead. Flower of large size, the dorsal sepal white, greenish at the base, and slightly spotted; petals and labellum honey-yellow.

To *Cypripedium* × 'Littlecot' ('J. M. Black' × 'Persens') (votes unanimous), from Messrs. Black & Flory, Slough. The well-formed dorsal sepal is boldly marked with dark claret-coloured spots; petals and labellum proportionately developed.

To *Cypripedium* × 'Windrush' var. 'Menteith' ('Radium' × 'Memoria F. M. Ogilvie') (votes 9 for, 1 against), from Messrs. McBean. The dorsal sepal is slightly incurved and heavily spotted, while the petals are broad.

Other Exhibits.

Messrs. Armstrong & Brown, Tunbridge Wells: *Cypripedium* × 'Cappa Magna.'

F. J. Hanbury, Esq.: *Cypripedium* × 'Jungfrau' var. *rotundum* and various *Cymbidium* hybrids.

Messrs. Black & Flory: *Cypripediums*.

A. P. Cunliffe, Esq., Druids Lodge, Salisbury: *Cattleya* × 'Clotho' var. 'Druid.'

Mrs. Carl Holmes: *Odontoglossum* × 'Muralis' var. 'Inspiration,' with a spike of eleven flowers.

Lady Aberconway and the Hon. H. D. McLaren, Bodnant, N. Wales: the new *Cypripedium* × 'Balida' (*Fairrieanum* × 'Memoria F. M. Ogilvie') and *Cypripedium* × 'Eleone' ('Evelyn Ames' × 'Memoria F. M. Ogilvie').

Robert Paterson, Esq., Ardingly, Sussex: *Cypripedium* × 'Dicker' ('Golden Eagle' × 'Eureka') and *Cymbidium* × 'Moonlight.'

Messrs. H. G. Alexander, Tetbury: *Cypripedium* hybrids.

Gus Mayer, Esq., Woldingham: *Cattleya* × 'Corydon.'

ORCHID COMMITTEE, JULY 30, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twelve other members present.

Awards Recommended :—

First-class Certificate.

To *Miltonia* × *gallonensis*, Exbury var. (*Bleuana* × *Charlesworthii*) (votes unanimous), from Lionel de Rothschild, Esq., Exbury, Southampton. Flowers unusually large, of thick texture, creamy-white. The labellum has a light cerise mask, with radiating lines of deeper tint and a crest of old gold.

To *Laeliocattleya* × 'Sargon' var. 'Vesuvius' (*C. Hardyana* × *L.-c.* × 'Lustre') (votes 7 for, 3 against), from Messrs. H. G. Alexander, Ltd., Tetbury, Glos. Flowers of large size, the sepals and petals rich rose-purple, the latter with a darker venation, labellum ruby-purple, the side lobes and disc shaded with crimson.

Award of Merit.

To *Cattleya* × 'Gladiator' (*Dowiana* × 'Gladys') (votes 7 for, 3 against), from F. J. Hanbury, Esq., Brockhurst, East Grinstead. Richly coloured, the sepals yellowish with a deep rose suffusion, the petals deep rose tinged with purple, the labellum bright golden-yellow, margined with crimson-purple.

Other Exhibits.

Messrs. Charlesworth, Haywards Heath : a group of species and hybrids.

Messrs. Sanders, St. Albans : a group.

Mrs. Carl Holmes, The Node, Welwyn : *Brassolaeliocattleya* × 'Pittohara.'

F. J. Hanbury, Esq. : *Odontoglossum* × 'Harold.'

Messrs. Cowan, Southgate : *Laeliocattleya* × 'Canberra.'

ORCHID COMMITTEE, AUGUST 13, 1929.

CHAS. H. CURTIS, Esq., in the Chair, and four other members present.

Awards Recommended :—

Cultural Commendation.

To Mr. J. Band, Orchid grower to Frank Mercer, Esq., Clovelly, Steyning, Sussex, for *Aerides Fieldingii*, with a many-flowered inflorescence.

Other Exhibits.

Messrs. Charlesworth, Haywards Heath : a group of garden-raised hybrids.

Messrs. Cowan, Southgate : *Cattleya* × 'Gloriette' and *C.* × *ardens*.

Messrs. Black & Flory, Slough : *Miltonia* hybrids in the vexillaria section.

Messrs. McBean, Cooksbridge : *Odontioda* × 'Cornelia' var. 'Empress.'

ORCHID COMMITTEE, AUGUST 27, 1929.

LIONEL DE ROTHSCHILD, Esq., in the Chair, and eight other members present.

Awards Recommended :—

Award of Merit.

To *Laeliocattleya* × 'Titymoma' var. *rotunda* (*C.* × 'Tityus' × *L.-c.* × 'Momus') (votes 8 for), from Robert Paterson, Esq., Ardingly, Sussex. Flower large, firm, with well-developed petals round in outline, rich rosy-mauve, the labellum dark crimson-purple.

To *Miltonia* × *Bleuana* var. 'Langley Beauty' (*vexillaria* × *Roetzlii*) (votes 6 for), from Messrs. Black & Flory, Slough. A very promising hybrid with sepals and petals ruby-crimson, the labellum purplish, with a whitish margin.

Preliminary Recognition.

To *Miltonia* × 'Memoria H. T. Pitt' var. *exquisita* ('Princess Mary' × 'Wm. Pitt') (votes 7 for), from Robert Paterson, Esq., Ardingly, Sussex. Flower rose-coloured, with purple suffusion on the sepals and labellum, the petals dark crimson.

Other Exhibits.

Messrs. Sanders, St. Albans : species and hybrids.

Messrs. Black & Flory, Slough : *Cattleya* × 'Lorna' with white sepals and petals.

F. J. Hanbury, Esq., East Grinstead : *Cattleya* × 'Aeneas' and *Laelio-cattleya* × 'Mrs. Medo,' Brockhurst var.

Robert Paterson, Esq. : *Cattleya* × 'Canberra,' a showy hybrid with golden-yellow flowers, the labellum cerise.

ORCHID COMMITTEE, SEPTEMBER 10, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and eleven other members present.

Awards Recommended :—*First-class Certificate.*

To *Laeliocattleya* × 'Queen Mary' var. 'Crimson Glory' (*L.-c.* × 'Lustre' × *C. Peetersii*) (votes 6 for, 2 against), from Robert Paterson, Esq., Ardingly, Sussex. Sepals and petals rosy-mauve, tinged with crimson, the well-formed labellum deep ruby-crimson.

To *Laeliocattleya* × 'Titymoma,' Stonehurst var. (*C.* × 'Tityus' × *L.-c.* × 'Momus') (votes 9 for), from Robert Paterson, Esq., Ardingly, Sussex. Flower large, of rosy-mauve colour, the labellum crimson-purple and with a golden throat.

Award of Merit.

To *Laeliocattleya* × 'Cavalese,' Stonehurst var. (*L.-c.* × 'Lustre' × *C.* × 'Fabia') (votes 8 for), from Robert Paterson, Esq. Petals unusually well-developed, rosy-mauve, the labellum rich purple shaded with crimson.

To *Brassolaeliocattleya* × 'Golden Crown' var. 'John Band' (*B.-l.-c.* × 'Joan' × *C.* × 'Venus') (votes 8 for, 1 against), from Frank Mercer, Esq., Clovelly, Steyning, Sussex. Spike of four flowers, medium size, golden-yellow, the labellum with some cerise colour on the margin.

To *Brassolaeliocattleya* × 'The Duchess' (*L.-c.* × 'Illustris' × *B.-l.-c.* × 'The Baroness') (votes 7 for, 3 against), from Robert Paterson, Esq., Ardingly, Sussex. Flower of medium size, bright golden-yellow, the labellum bordered with light cerise.

Other Exhibits.

Mrs. Carl Holmes, Welwyn, Herts : *Miltonia* × *Sanderiana* var. 'Margot Holmes.'

Gus Mayer, Esq., Woldingham, Surrey : well-flowered plant of *Gongora quinquenervis*.

Messrs. Charlesworth, Haywards Heath : *Odontoglossum* × 'Eudora' and *Sophrolaeliocattleya* × 'Thelma.'

Baron Bruno Schröder, Englefield Green, Surrey : *Potinara* × 'Dorothy' of soft yellow colour.

ORCHID COMMITTEE, SEPTEMBER 19, 1929.

F. J. HANBURY, Esq., in the Chair, and nine other members present.

Awards Recommended :—*First-class Certificate.*

To *Potinara* × 'Dorothy,' Dell Park var. (*S.-l.-c.* × 'Prince Hirohito' × *B.-l.-c.* × *maculata*) (votes 8 for), from Baron Bruno Schröder, Englefield Green, Surrey. Flower soft yellow with golden shading, the labellum orange-yellow with reddish-carmine around the front area, the throat veined with orange-yellow.

Award of Merit.

To *Laeliocattleya* × 'Profusion,' Stonehurst var. (*L.-c.* × 'Serbia' × *C. Hardyana*) (votes 8 for), from Robert Paterson, Esq., Ardingly, Sussex. Spike of four large flowers, rosy-mauve, labellum rich purple.

To *Laeliocattleya* × 'Ishtar' var. *magnifica* (*L.-c.* × 'Sargon' × *C.* × 'Fabia') (votes 9 for), from Robert Paterson, Esq. Richly coloured, sepals and petals dark rosy mauve, labellum purple with crimson mottling.

To *Cattleya* × 'Mimosa' var. 'Primrose Queen' ('Venus' × *triumphans*) (votes 5 for, 1 against), from Messrs. Cowan, Southgate. Sepals and petals bright golden-yellow, labellum ruby-crimson.

To *Gongora maculata* (votes 6 for, 3 against), from Messrs. Charlesworth, Haywards Heath. This closely resembles the coloured plate in the *Botanical Magazine*, t. 3687. The pendulous spike bore 33 flowers.

Other Exhibits.

S. G. Brown, Esq., Shepperton: *Laeliocattleya* × 'Senator.'

Messrs. Armstrong & Brown, Tunbridge Wells: *Cattleya* × 'Gisie' var 'Golden Queen.'

Messrs. Cowan: two varieties of *Laeliocattleya* × 'Canberra.'

Robert Paterson, Esq.: *Brassolaeliocattleya* × 'Vera.'

ORCHID COMMITTEE, OCTOBER 2, 1929.

F. J. HANBURY, Esq., in the Chair, and seven other members present.

Awards Recommended:—

Silver Floral Medal.

To Messrs. Sanders, St. Albans, for species and hybrids.

Silver Banksian Medal.

To Messrs. Stuart Low, Jarvis Brook, Sussex, for a group.

Award of Merit.

To *Cattleya* × 'Helioglow' ('Golden Glow' × 'Heliodor') (votes unanimous), from Baron Bruno Schröder, Englefield Green, Surrey. Flowers of medium size, bright golden-orange, the labellum fringed at the margin.

To *Brassolaeliocattleya* × 'Helolata' (*C.* × 'Heliodor' × *B.-l.-c.* × *maculata*) (votes 6 for), from Baron Bruno Schröder. A pleasing primrose-yellow flower, the disc of the labellum chrome-yellow.

Other Exhibits.

Robert Paterson, Esq., Ardingly, Sussex: *Laeliocattleya* × 'Profusion' with a spike of five large flowers.

Gus Mayer, Esq., Woldingham, Surrey: two *Mormodes* species.

ORCHID COMMITTEE, OCTOBER 8, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and nine other members present.

Awards Recommended:—

First-class Certificate.

To *Cattleya* × 'Horos' ('Heliodor' × 'Sunbeam') (votes unanimous), from Baron Bruno Schröder, Englefield Green, Surrey. Sepals and petals golden-yellow, the lip round, margined with ruby colour.

Award of Merit.

To *Sophrolaeliocattleya* × 'Jean' (*S. grandiflora* × *L.-c.* × 'Orange Beauty') (votes 6 for, 2 against), from Messrs. Alexander. A pretty hybrid with bright salmon-orange flowers, labellum of deeper tint and throat clear yellow.

ORCHID COMMITTEE, OCTOBER 23, 1929.

LIONEL DE ROTHSCHILD, Esq., in the Chair, and nineteen other members present.

Awards Recommended :—

Gold Medal.

- To F. J. Hanbury, Esq., Brockhurst, East Grinstead, for a group.
- To Messrs. Charlesworth, Haywards Heath, for a group of home-raised species and hybrids.
- To Messrs. Sanders, St. Albans, for a large group of species and hybrids.

Schröder Challenge Cup.

- To F. J. Hanbury, Esq., for the best group shown by an amateur.

Challenge Cup for group not exceeding 60 square feet.

- To Robert Paterson, Esq., Ardingly, Sussex.

Silver-gilt Flora Medal.

- To Messrs. McBean, Cooksbridge, Sussex, for a group.
- To Messrs. Alexander, Tetbury, Glos., for a group of Cattleyas, etc.

Silver Flora Medal.

- To Messrs. Stuart Low, Jarvis Brook, Sussex, for a group of species and hybrids.
- To J. J. Joicey, Esq., Witley, Surrey, for a group.
- To S. G. Brown, Esq., Shepperton, Middlesex, for a group.
- To Messrs. Cowan, Southgate, for a group of autumn-flowering Cattleyas.

Silver-gilt Banksian Medal.

- To Robert Paterson, Esq., for a group.

Silver Banksian Medal.

- To Lord Melchett, Romsey, Hants, for Cattleyas and Cypripediums.
- To Ernest R. Ashton, Esq., Tunbridge Wells, for a group.
- To Mr. John Evans, Colwyn Bay, for a group.

Banksian Medal.

- To Mr. Harry Dixon, Wandsworth Common, for a group.
- To Messrs. Sutton Bros., Hassocks, for a group.

Silver Trophy for Twelve Orchids.

- To Gus Mayer, Esq., Wistler's Wood, Woldingham, Surrey.

First-class Certificate.

To *Brassolaeliocattleya* × 'Ambaurea' (B.-I.-c. × 'Amber' × C. × *Dowiana aurea*) (votes 15 for, 1 against), from Baron Bruno Schröder, Englefield Green, Surrey. Rich soft yellow, labellum bordered with cerise.

Award of Merit.

To *Habenaria Lugardii* (votes 16 for), from Messrs. Sanders. A tropical African species with large suborbicular leaves and a scape about 20 inches high, with eighteen white flowers, each having a greenish spur, 8 inches long, filled with nectar.

To *Cycnoches Loddigesii* (votes 16 for), from C. S. Garnett, Esq., Derby. An interesting species originally discovered in 1834, and now shown with a spike of three female flowers, greenish-brown with reddish-brown suffusion on the petals.

To *Laeliocattleya* × 'Cavalese' var. *excelsa*. (L.-c. × 'Lustre' × C. × 'Fabia') (votes 16 for), from Messrs. Alexander. Large soft rose flowers, the labellum purple with crimson shading.

To *Brassocattleya* × 'British Queen' var. 'Stonehurst' (B.-c. × *Digbyano-Mendelii* × B.-c. × 'Lord Rothschild') (votes 17 for, 1 against), from Robert Paterson, Esq. Flowers very large, uniform rose-pink, the labellum with a yellowish centre.

To *Miltonia* × *pulchra* var. 'Enchantress' ('Wm. Pitt' × 'Lycaena') (votes 18 for), from Messrs. Charlesworth, Haywards Heath.

To *Cattleya* × 'Gloriette' var. 'The Node' (*C.* × 'Tityus' × *C.* × *Hardyano-Warneri*) (votes unanimous), from Mrs. Carl Holmes, Welwyn, Herts.

To *Laeliocattleya* × 'Cassandra' (*L.-c.* × 'Sargon' × *L.-c.* × 'Gladiator') (votes unanimous), from Lord Melchett. A pleasing rosy mauve flower, the purple labellum marked with crimson mottling.

Preliminary Commendation.

To *Odontoglossum* × 'Zenon' var. 'Isobel' ('St. James' × 'Rosina'), (votes 13 for), from Gus Mayer, Esq. Large flowers with reddish-purple blotching on a rose ground.

Cultural Commendation.

To Messrs. McBean, Cooksbridge, Sussex, for *Laeliocattleya* × 'Queen Mary' with sixteen flowers on four spikes.

Vote of Thanks.

To C. H. Lankester, Esq., for kindly showing numerous photographs of Costa Rican Orchids.

ORCHID COMMITTEE, NOVEMBER 5, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, Sussex, for group.

First-class Certificate.

To *Brassolaeliocattleya* × 'Heliolata' (*C.* × 'Heliodor' × *B.-l.-c.* × *maculata*) (votes unanimous), from Baron Bruno Schröder, Englefield Green, Surrey. Soft amber-yellow, labellum with a faint orange tint and minutely fringed.

To *Brassolaeliocattleya* × 'Queen Elizabeth' (*B.-c.* × 'British Queen' × *L.-c.* × 'Ivanhoe') (votes unanimous), from Baron Bruno Schröder. Large, soft rosy-mauve, the labellum more intensely coloured and with an orange-yellow centre.

To *Laeliocattleya* × 'Queen Mary,' Stonehurst var. (*L.-c.* × 'Lustre' × *C.* × *Peetersii*) (votes unanimous), from Robert Paterson, Esq., Ardingly, Sussex. A large flower of mauve-purple colour in the sepals and petals, the labellum deep purple flushed with ruby.

To *Vuykstekeara* × 'Edna,' Stamperland var. (*M. Harwoodii* × *Odontioda* × *Charlesworthii*) (votes unanimous), from Robert Paterson, Esq., Ardingly, Sussex. Flowers light velvety crimson, the labellum deep cerise.

Other Exhibits.

Mr. John Evans, Colwyn Bay : *Vanda coerulnea*.

Gus Mayer, Esq., Woldingham, Surrey : *Laeliocattleya* × 'Cornelius.'

F. J. Hanbury, Esq., East Grinstead : *Cypripedium* × 'Lucifer' var. 'Ruby Gem.'

ORCHID COMMITTEE, NOVEMBER 19, 1929.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

Banksian Medal.

To Messrs. Stuart Low, Jarvis Brook, Sussex, for species and hybrids.

To Messrs. Cowan, Southgate, for *Cypripediums*, etc.

To Messrs. Sanders, St. Albans, for species and hybrids.

First-class Certificate.

To *Miltonia* × *pulchra* var. 'Lyoth' ('Wm. Pitt' × 'Lycæna') (votes 14 for), from Messrs. Charlesworth. A well-formed rich velvety crimson flower with a narrow margin of rose on the petals and on the tips of the sepals. The labellum has a light reddish mask, surrounded by a mauve zone.

Award of Merit.

To *Miltonia* × 'Lydia' var. 'Regina' ('Princess Mary' × 'Beau Brummel') (votes 11 for, 3 against), from Messrs. Charlesworth. Sepals and petals crimson, labellum with a brownish crimson base.

To *Laeliocattleya* × 'Moloch' var. 'Stromboli' (*L.-c.* × 'St. Gothard' × *L.-c.* × 'Sargon') (votes unanimous), from Messrs. H. G. Alexander, Tetbury, Glos. Large flowers of purple-rose colour, the labellum ruby-crimson with a purple margin.

To *Putinara* × 'Rosita' (*S.-l.-c.* × *langleyensis* × *B.-c.* × 'Rosita') (votes 12 for, 2 against), from Robert Paterson, Esq., Ardingly, Sussex. Flower of large size, lemon-yellow slightly marked with light mauve.

To *Cypripedium* × 'Liancayo' ('Mrs. Rickards' × ?) (votes 16 for, 1 against), from R. Windsor Rickards, Esq., Usk Priory, Monmouthshire. The well-formed dorsal sepal is white, with a greenish base, and effectively marked with crimson-purple spots, occasionally confluent; the sepals and labellum are yellowish shaded with brown.

Other Exhibits.

Baron Bruno Schröder, Englefield Green, Surrey: *Sophrolaeliocattleya* × 'Tokio.'

Gus Mayer, Esq., Woldingham, Surrey: a *Gongora* species.

Robert Paterson, Esq., Ardingly, Sussex: *Cypripedium* × 'Baldovan.'

Mrs. Carl Holmes, Welwyn, Herts: *Cypripedium* × 'Euryodin' and *C.* × 'John Henry.'

Messrs. Black & Flory, Slough: *Cypripedium* × 'Dunblane' and *Brassocattleya* × 'George Ward.'

Messrs. Armstrong & Brown, Tunbridge Wells: *Cypripedium* × 'Warrior' var. 'Montague.'

ORCHID COMMITTEE, JANUARY 14, 1930.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen other members present.

Awards Recommended:—

Gold Medal.

To Miss A. B. Moore, Chardwar, Bourton-on-the-Water, Glos., for group of *Cypripediums*.

To Messrs. Charlesworth, Haywards Heath, Sussex, for group of hybrids.

To Messrs. McBean, Cooksbridge, Sussex, for group of various Orchids.

Silver-gilt Banksian Medal.

To Messrs. Sanders, St. Albans, for exhibit of species and hybrids.

Silver Banksian Medal.

To S. G. Brown, Esq., Shepperton, for a group.

To Dr. Craven Moore, Duckys Park, East Grinstead, for *Cypripediums*.

To Messrs. Armstrong & Brown, Tunbridge Wells, for *Cypripediums*.

To Messrs. Cowan, Southgate, for a group.

To Messrs. Stuart Low, Jarvis Brook, Sussex, for a group.

To Messrs. Alexander, Tetbury, Glos., for *Cypripediums*.

Banksian Medal.

To Messrs. A. J. Keeling, Bradford, for a group.

To Mr. John Evans, Colwyn Bay, for *Cypripediums*.

First-class Certificate.

To *Cypripedium* × 'Jungfrau,' Brockhurst var. ('Miss A. A. Locke' × 'Christopher' var. 'Grand Duke Nicholas') (votes 10 for, 3 against), from

F. J. Hanbury, Esq., Brockhurst, East Grinstead. The large dorsal sepal is white with a greenish base and a few purplish spots; the petals and labellum are light greenish-yellow.

Award of Merit.

To *Milkenia* × 'Memoria H. T. Pitt,' Stonehurst var. ('Princess Mary' × 'William Pitt') (votes unanimous), from Robert Paterson, Esq., Ardingly, Sussex. Sepals and petals reddish-crimson, the labellum purplish-rose with small spotting surrounding the yellow crest.

To *Cypripedium* × 'Dicker,' Stonehurst var. (votes unanimous), from Robert Paterson, Esq. Apple-green, the dorsal sepal profusely marked with blackish spots.

To *Odontonia* × 'Olga' var. 'The Premier' (*Odontonia* 'Thisbe' × *Odontoglossum crispum*) (votes 12 for), from Messrs. Charlesworth, Haywards Heath. Flowers of thick texture, pure white, the labellum having a few brownish-red markings.

To *Cattleya* × 'Suavior' var. *flammea* (*intermedia* var. *Aquinii* × *Mendelii*) (votes 10 for, 3 against), from Messrs. Charlesworth, Haywards Heath. The apical half of each petal is bright purple, thus closely resembling the coloration of the labellum.

To *Odontoglossum* × 'Dusky Emperor' ('Emperor' × 'Dusky Monarch') (votes unanimous), from Messrs. Charlesworth. Spike of fourteen flowers of chocolate-red colour, the sepals and petals margined with white.

To *Cypripedium* × 'Nena' var. 'The Queen' ('Chloris' × 'Christopher' var. 'Grand Duke Nicholas') (votes 13 for), from A. E. Dale, Esq., Upton, Manchester. Flower very large, the white dorsal sepal heavily marked with dark crimson-purple spotting.

To *Cypripedium* × 'Midas' var. 'The King' ('Golden Fleece' × 'Actaeus' var. 'Bianca') (votes 11 for), from F. J. Hanbury, Esq., Brockhurst, East Grinstead. Of soft yellow colour, except for a deep white apex to the dorsal sepal.

To *Cypripedium* × 'Mecca' var. 'Mrs. W. J. P. Marling' ('Prince Albert' × *Lathamianum* var. 'Cardinal Mercier') (votes 8 for, 2 against), from Miss A. B. Moore.

Cultural Commendations.

To Mr. H. Butcher, Orchid grower to Sir William Cooke, Bt., Wyld Court, Hampstead Norris, for *Coelogyne Mooreana*, Westonbirt var.

To Messrs. Cowan, for *Angraecum sesquipedale*, a well-cultivated plant with fourteen flowers.

Other Exhibits.

Mrs. Brooman White, Arddarroch, Garelochhead: *Cymbidium* × 'Vesta' var. 'Loch Long.'

Baron Bruno Schröder: *Laeliocattleya* × 'Aconcagua,' a very fine variety.

C. Glidden Osborne, Esq., Marlow, Bucks: *Odontoglossum* × 'Alvara,' Highfield's var.

J. J. Joicey, Esq., Witley, Surrey: *Cypripedium* × 'Pekoe' and *Odontioda* × 'Enchantress.'

Lionel de Rothschild, Esq., Exbury: *Cypripedium* × 'Burston' and *Cypripedium* 'John Walker.'

Gus Mayer, Esq., Woldingham: *Sophrolaeliocattleya* × 'Dora' var. 'Gustavus.'

Robert Paterson, Esq.: *Cypripedium* × 'Lucodin' and *Odontioda* × 'Mena.'

A. E. Dale, Esq., Upton, Wirral: *Cypripedium* × *Worsleyi* and the Ardaco variety of *Cypripedium* × 'Dan.'

ORCHID COMMITTEE, JANUARY 28, 1930.

F. J. HANBURY, Esq., in the Chair, and fifteen other members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for a group.

To Messrs. Sanders, St. Albans, for a group.

To Messrs. Stuart Low, Jarvis Brook, for a group.

To Messrs. Alexander, Tetbury, Glos., for *Cypripediums*.
To Messrs. Cowan, Southgate, for a group.
To Messrs. Armstrong & Brown, Tunbridge Wells, for a group.

Banksian Medal.

To Mr. John Evans, Colwyn Bay, for a group.
To Lady Hadden, Berkhamstead, for *Calanthes* and *Cypripediums*.

First-class Certificate.

To *Calanthe* × 'Stella' ('Ruby' × *kewensis*) (votes 10 for, 3 against), from Baron Bruno Schröder, Englefield Green, Surrey. Spikes of medium height, bearing flowers of reddish-rose colour. A basket of twenty-one plants was staged.

Award of Merit.

To *Brassolaeliocattleya* × *flavida*, Dell Park var. (*L.-c.* × 'Golden Queen' × *B.-l.-c.* × 'Amber') (votes 10 for, 2 against), from Baron Bruno Schröder. Large flower of deep chrome-yellow, the labellum with some rose-pink markings.
To *Laeliocattleya* × 'Edzell' var. 'Majestic' (*L.-c.* 'Majestic' × *C. Trianae*) (votes 8 for, 3 against), from Messrs. Sanders. Flowers large, purple and mauve, the labellum darker.

To *Cypripedium* × 'Lady Stanton,' Chardwar var. ('Charlotte Dillon' × 'Memoria H. J. Elwes') (votes 12 for), from Miss A. B. Moore, Chardwar, Bourton-on-the-Water, Glos. Dorsal sepal round, white, with a greenish base, labellum and petals mahogany-red.

Other Exhibits.

Robert Paterson, Esq., Ardingly, Sussex: *Lycaste Skinneri alba*.
F. J. Hanbury, Esq., East Grinstead: *Laeliocattleya* × 'Sunbelle' var. *perfecta* and *Cypripedium* × 'Diane.'
Miss A. B. Moore: *Cypripedium* × 'Debroo' and *Cypripedium* × 'Chubb.'
Sir William Cooke, Bt., Wyld Court, Hampstead Norris: *Cymbidium* × 'Curlew' with a spike of sixteen flowers.
Mrs. Carl Holmes, Welwyn, Herts: *Cypripedium* × 'Pickabiades,' a very pleasing hybrid.
Messrs. Black & Flory, Slough: *Cypripedium* × 'Grace Darling.'

ORCHID COMMITTEE, FEBRUARY 11, 1930.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen other members present.

Awards Recommended:—

Gold Medal.

To Messrs. McBean, Cooksbridge, for a group.

Silver-gilt Banksian Medal.

To Messrs. Sanders, St. Albans, for a group.

Silver Banksian Medal.

To S. G. Brown, Esq., Shepperton, for a group.
To Mr. John Evans, Colwyn Bay, for a group.

Banksian Medal.

To Messrs. Harry Dixon, Wandsworth Common, for a group.

First-class Certificate.

To *Cymbidium* × 'Pearl' var. *magnificum* (*Alexanderi* × *grandiflorum*) (votes unanimous), from Messrs. McBean. Flowers greenish with brown tinting, the labellum white with deep crimson-red markings on the front lobe.

To *Odontoglossum* × *havengtense* var. 'Wyld Court' (*crispum* × *triumphans*) (votes 13 for), from Sir William Cooke, Bt., Wyld Court, Hampstead Norris. The spike bore fifteen large flowers, bright red-brown, margined with yellow.

Award of Merit.

To *Odontoglossum* × 'Vandalia' (hybrid × 'Mars') (votes 12 for), from Messrs. McBean. Of rich crimson-red colour, the segments bordered with white.

To *Cymbidium* × 'Venus' var. 'Dionce' (*Holfordianum* × *insigne*) (votes 10 for, 1 against), from Messrs. McBean. Flowers greenish, the labellum light cream colour, profusely spotted with reddish-brown.

Other Exhibits.

Messrs. Alexander, Tetbury, Glos. : *Cypripediums* and *Cymbidiums*.

Messrs. Charlesworth, Haywards Heath : a small group of hybrids.

M. le Compt Jos. de Hemptinne, Ghent, Belgium : *Cypripedium* × 'Chouette' ('Dixie' × 'Draco'), a distinct hybrid.

Baron Bruno Schröder : *Cattleya* × 'Minnehaha' pure white.

ORCHID COMMITTEE, FEBRUARY 25, 1930.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for a group.

To Messrs. Stuart Low, Jarvis Brook, Sussex, for a group.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, Sussex, for a group.

To Messrs. Sanders, St. Albans, for *Cymbidiums*.

Bronze Medal.

To F. J. Hanbury, Esq., East Grinstead, for *Dendrobiums*.

To Messrs. Harry Dixon, Wandsworth Common, for a group.

First-class Certificate.

To *Sophrolaeliocattleya* × 'Tokio' (*S.-l.-c.* × 'Prince Hirohito' × *L.-c.* × 'Ivanhoe') (votes 10 for, 1 against), from Baron Bruno Schröder, Englefield Green, Surrey. Rosy-carmine, salmon-tinted on the basal part of the petals and faint violet on the margins. Labellum ruby.

Award of Merit.

To *Cypripedium* × 'Gertrude West' ('Lady Phulmoni' × 'Robert Paterson') (votes 12 for, 1 against), from Messrs. Black & Flory, Slough. Flower large. Dorsal sepal round, white, with a green base, profusely spotted. Petals greenish, heavily flushed with red-brown.

To *Cymbidium* × 'Rosy Queen' (*Alexanderi* × 'Vesta') (votes 15 for), from Mrs. Carl Holmes, The Node, Welwyn. Of a pleasing rose-pink; labellum white, except for the rose-pink apex.

To *Odontioda* × 'Mary Holmden' (*Oda.* 'Gatton Glory' × *Odm.* 'Doris') (votes 12 for, 3 against), from Sir Jeremiah Colman, Bt., Gatton Park, Surrey. Flowers rich red-brown margined with soft yellow, the apex of the labellum slightly lighter.

Other Exhibits.

Sir Jeremiah Colman, Bt. : *Cymbidium* × 'Queen of Gatton' with a spike of thirteen rose-pink flowers.

E. Martin Smith, Esq., Hitchin, Herts : a large plant of what the Committee considered a variety of *Cymbidium* × *Alexanderi*.

Messrs. Armstrong & Brown, Tunbridge Wells : *Cypripedium* × 'Amazon.

Messrs. Black & Flory : *Odontioda* × 'Harvest Moon' and *Cattleya* × 'Canada' var. 'Ruth.'

LIST OF DONATIONS TO THE SOCIETY'S GARDENS, 1929.

- ABOL LTD., Messrs., Paddock Wood. Tin of "White Oil Emulsion E.D. 15" for trial.
- ALGIERS BOTANIC GARDEN. Collection of seeds.
- ALLEN, A. DUNSCOMBE, London. Seed of *Boronia megastigma*.
- AMANI INSTITUTE, Tanganyika. Seed of *Vinca alba*, *Vinca rosea*, *Grevillea robusta*, *Grevillea Banksii*.
- AMSTERDAM BOTANIC GARDEN. Collection of seeds.
- ARMITAGE, Miss E., Dadnor. Purple Primroses.
- ATLEE, BURPEE & Co., Messrs., Philadelphia. Bush Beans, Lettuce, Cauliflowers, Asters, Arctotis, Swiss Chard, for trial.
- AYRES, Dr. W. M., Ohio. Iris for trial.
- BAARN BOTANIC GARDEN. Collection of seeds.
- BAKER, G. P., Sevenoaks. Plant of *Saxifraga porophylla thessalica*, *Arnebia echinoides*; seed of *Phaseolus Caracalla*, *Viola orbatica*, *Fritillaria graeca*, *Jankaea Heldreichii*.
- BALCOMBE, W., Wokingham. Seed of *Indigofera Kirilkwii*, *Lilium sulphureum*, *Indigofera hypoleuca*.
- BALFOUR, Major. Bulbs from Japan.
- BALLARD, E., Colwall. Aster for trial.
- BARBER-STARKEY, F., British Columbia. Two Carnations.
- BARBIER, M., Orleans. Collection of Lilacs.
- BARR & SONS, Messrs., Taplow. Gaillardias, Asters, Cauliflowers, Leeks, Lettuce, Beet, Seakale, Dwarf French Beans, Potatos, Chrysanthemums, Cabbages, Onions, for trial; miscellaneous plants and seeds; books for Library; seed of *Gentiana Kurroo*.
- BARTHOLOMEW, A. C., Reading. Collection of plants.
- BASEL BOTANIC GARDEN. Seeds of *Campanula barbata*, *Delphinium tatsiense*.
- BATH LTD., Messrs. R. H., Wisbech. Asters, Cauliflowers, Raspberries, Chrysanthemums, Narcissus, for trial.
- BATT, R. C., Norwich. Currant bushes for trial.
- BAYER PRODUCTS LTD., Messrs., London. Samples of "S.V. 375," "Ustin," and "Nosprasil" for trial.
- BECKETT, E., Elstree. Grafts of Apples, Asters, for trial.
- BELGRADE BOTANIC GARDEN. Collection of seeds.
- BELVEDERE BOTANIC GARDEN, Austria. Collection of seeds.
- BENARY, ERNST, Erfurt. Gaillardias, Asters, for trial.
- BENNETT, J. C., British Columbia. Plants and seeds.
- BERLIN-DAHLEM BOTANIC GARDEN. Collection of seeds.
- BERN BOTANIC GARDEN. Collection of seeds.
- BLACKMORE & LANGDON, Bath. Delphiniums for trial.
- BLOSSFIELD, R., Potsdam. Asters for trial.
- BODGER & SONS, Messrs., California. Asters for trial.
- BORDEAUX BOTANIC GARDEN. Seed of *Lysimachia ephemerum*, *Lonicera confusa*, *Linum corymbiferum*.
- BOSTOCK, F., Northampton. Iris for trial.
- BOSTON ROSE FARMS, THE, Boston. Tulips for trial.
- BOSWELL, N. F., Evesham. Brussels Sprouts for trial.
- BOTANIC GARDEN IN RUSSIA. Collection of seeds.
- BOWLES, E. A., Waltham Cross. Seed of *Aethionema schistosum*, Dixcroft var.; Crocus corms.
- BOWRING, Mrs. F., Winchfield. Roots of Blue Water Lily.
- BRIDGEFORD, J. M., Covent Garden. Plants of *Viola* 'White Gem' and 'Lavender Gem.'
- BRISTOL UNIVERSITY BOTANIC GARDEN. Seed of *Oenothera ammophila*, *Dianthus prolifer*, *Dianthus banaticus*.
- BRITISH INDUSTRIAL SEC. LTD., THE, London. Tins of "Agral" for trial.
- BROOKLYN BOTANIC GARDEN. Collection of seeds.
- BRUSSELS BOTANIC GARDEN. Collection of seeds.
- BRUX BOTANIC GARDEN. Collection of seeds.
- BUCHANAN, Dr., Bothwell. Collection of plants and seeds.
- BUCHAREST BOTANIC GARDEN. Collection of seeds.

- BUDAPEST BOTANIC GARDEN. Collection of seeds.
- BULLAR, Mrs., Guernsey. Seed of *Asparagus retrofractus*, *Bignonia Tweediana*.
- BULLEY, N. K., Ness. Collection of seeds.
- BURRELL & Co., Messrs., Cambridge. Dahlias for trial.
- BURTON, F., Hildenborough. Iris.
- BUTLER, A. F., Honduras. Seed of *Psidium guajara*, Cuban var.; *Schinus terebinthifolius*, *Flacourtia Ramontchii*.
- BUTTON, C., Cranham. *Berberis* sp. from Tibet.
- BUXTON, B. H., Byfleet. Seedling of *Digitalis purpurea* × *ambigua*.
- CAEN BOTANIC GARDEN. Seed of *Ranunculus gramineus*, *Pulsatilla grandis*.
- CAMBRIDGE BOTANIC GARDEN. Collection of seeds.
- CAMBRIDGE BOTANIC GARDEN, U.S.A. Collection of seeds.
- CAMPBELL, H., Cyprus. Seeds of *Quercus alnifolia*.
- CARTER & Co., Messrs. J., Raynes Park. Dwarf French Beans, Gaillardias, Asters, Beet, Lettuce, Cauliflowers, Leeks, Cabbages, Onions, for trial.
- CARTER PAGE & Co., Messrs., London. Gaillardia for trial.
- CATCHPOLE, N., Brighton. *Felcia petiolata*.
- CAVE, Sir C., Sidmouth. Seed of *Pinus Montezumae*.
- CERNAUTI BOTANIC GARDEN. Collection of seeds.
- CHEAL & SONS, Messrs., Crawley. Dahlias for trial.
- CHELSEA PHYSIC GARDEN. Collection of seeds.
- CHITTENDEN, per Mr. *Plantago cretica*.
- CHURCH, L. A. KING, Gold Coast. Bulbs of *Lissochilus* sp.
- CLARENCE ELLIOTT EXPEDITION. Seed of *Habranthus hesperina*.
- CLARK, J., Scarborough. Chrysanthemums for trial.
- CLUCAS, Messrs. J. L., Ormskirk. Dwarf French Beans, Leeks, Beet, Lettuce, Cauliflowers, Asters, Onions, Cabbages, for trial.
- CLUTTERBUCK, Sir P. H., Walton. Collection of New Zealand seeds.
- COBB, A. J., Reading. Dahlias, Violas, for trial.
- COIMBRA BOTANICAL INSTITUTE. Collection of seeds.
- COOPER PEGLER, Messrs., Finsbury Square. One top for variable lance.
- COOPER, TABER & Co., Messrs., London. Leeks, Cauliflowers, Lettuce, Beet, Dwarf French Beans, Seakale, Onions, Cabbages, for trial.
- COPENHAGEN BOTANIC GARDEN. Collection of seeds.
- CORNU, P. LE, Jersey. Roses for trial.
- CORY, R., Duffryn. *Picea Albertiana*.
- CRESSWELL, T. A., Ewhurst. Seed of *Meconopsis aculeata*.
- CULLEN & SONS, Messrs. T., Witham. Lettuce, Leeks, Cauliflowers, Onions, Cabbages, for trial.
- CYPRUS TRADE COMMISSIONER, Westminster. Onion sets of red and white Spanish varieties for trial.
- DAEHNFELDT & JENSEN, Messrs., Denmark. Cauliflowers, Lettuce, Leeks, Beets, Seakale, Gaillardias, Asters, for trial.
- DALRYMPLE, G. H., Southampton. Plants of *Primula nutans*.
- DANIELS BROS. LTD., Norwich. Potatos, Leeks, Lettuce, Cauliflowers, Beet, Dwarf French Bean, Gaillardias, for trial.
- DAVIDSON, Prof. JOHN, Vancouver. Collection of seeds.
- DAWKINS, A., Chelsea. Asters, Cauliflowers, Lettuce, for trial.
- DICKENS, Mrs., Rochester. Seed of *Juglans nigra* (Black Walnut).
- DICKSON & ROBINSON, Messrs., Manchester. Cauliflowers, Lettuce, Leeks, Beet, Cabbages, for trial.
- DICKSON & SONS, Messrs. A., Belfast. Leeks, Onions, for trial.
- DIJON BOTANIC GARDEN. Collection of seeds.
- DOBBIE & Co., Messrs., Edinburgh. Cauliflowers, Beet, Lettuce, Leeks, Dwarf French Beans, Gaillardias, Asters, Potatos, Chrysanthemums, Onions, Cabbages, for trial. Seed of Celery 'Invincible White.'
- DORPAT BOTANIC GARDEN. Collection of seeds.
- DRESDEN BOTANIC GARDEN. Collection of seeds.
- DUNEDIN BOTANIC GARDEN, N.Z. Collection of seeds.
- DUNEDIN CORPORATION, New Zealand. Seed of *Metrosideros tomentosa*.
- DURHAM, per F. R. Seed of *Clematis* sp., *Leptospermum* sp. from New Zealand; seed of *Halesia tetraptera*.
- DUVAL, Rev. S. P., Littlehampton. Seedling of *Leycesteria formosa*.
- DYKES, Mrs. W. R., Sutton Green. Irises for trial.
- EAST MALLING RESEARCH STATION. Black Currant bushes for commercial trials.
- EDINBURGH BOTANIC GARDEN. Collection of seeds.
- EDMISTON, N. J., Haslemere. Plants of *Oxalis*.
- EDWARDS, L. C., Cheltenham. Framed pencil portrait of John Lindley.

LIST OF DONATIONS TO THE SOCIETY'S GARDENS, 1929. clxv

- ELLIOTT, Messrs. C., Stevenage. Chrysanthemums for trial.
 ENGELMANN, C., Saffron Walden. *Rosa montecuma*.
 ERLANGEN BOTANIC GARDEN. Collection of seeds.
 FAIRBAIRN & SONS, Messrs., Carlisle. Phlox for trial.
 FERRIS, M. C., Sutton. Seed of Australian 'Leucin.'
 FINDLAY, R., Wisley. Seedlings of *Daphne mezereum*.
 FINNEYS, Messrs., Newcastle-on-Tyne. Asters, Cauliflowers, Lettuce, Beet, Cabbage, for trial.
 FISHER, SON, & SIBBAY, Messrs., Sheffield. Plants of Hollies, Rhododendrons, and *Taxus adpressa variegata*.
 FLEISCHMANN, Mrs., Buckingham. Delphinium for trial.
 FLOOD, E. P., Rainham. Buds of Cherry for trial.
 FOUR OAKS SPRAYING MACHINE Co., Birmingham. "Four Oaks" container.
 FREIBURG BOTANIC GARDEN. Collection of seeds.
 FRIKART, M. C., Stäfa. Collection of seeds.
 GARRETT, M. L., Lutterworth. Melon seed for trial.
 GAUT, R. C., Worcester. Raspberry canes for commercial trials.
 GAYBORDER NURSERIES, THE, Melbourne. Chrysanthemums for trial.
 GEARY, S., Hinckley. Roses for trial.
 GENEVA BOTANIC GARDEN. Collection of seeds.
 GIBSON, Messrs. G., Leeming Bar. Gaillardias for trial.
 GIUSEPPI, Dr., Felixstowe. Seed of *Primula* sp., *Gentiana* sp., and *Clematis* sp. Collection of bulbs.
 GLASNEVIN BOTANIC GARDEN. Collection of seeds.
 GOTENBORG BOTANIC GARDEN. Collection of seeds.
 GÖTTINGEN BOTANIC GARDEN. Collection of seeds.
 GREENLAND EXPEDITION. Collection of seeds.
 GRENFELL, A. P., Bridgwater. Strawberries for trial.
 GRÖNINGEN BOTANIC GARDEN. Collection of seeds.
 GUNNINGHAM, A. E., Gulval. Apple grafts for trial.
 HANSEN, A., Copenhagen. Wallflower and Cauliflower for trial.
 HANSON, Miss, Loughton. Seedlings of *Cornus* sp.
 HARKNESS, Messrs., Bedale. Seed of Lupins.
 HARLEY, A., Blinkbonny. Collection of seeds.
 HARRIS, A., Natal. Freesias for trial.
 HARRISON & SONS, Messrs., Leicester. Cauliflowers, Lettuce, Dwarf French Beans, Leeks, Beet, Cabbages, Onions, for trial.
 HARROW, Mr., Kingston. Seed of *Gentiana lutea*.
 HAY, T., Hyde Park. Seed of *Oenothera trichocarpa*; *Primula* seedlings; plants of *Anchusa italica* 'Dropmore,' *Campanula rupestris*, *Sphaeralcea subrhomboides*, Purple Primroses; *Meconopsis integrifolia*, *Meconopsis paniculata*.
 HAYDON, C. M., Orkney. Plants of *Primula scotica*.
 HEIDELBERG BOTANIC GARDEN. Collection of seeds.
 HEINEMANN, Messrs. F. C., Erfurt. Dwarf French Beans, Asters, Gaillardias, Lettuce, Cauliflowers, Leeks, for trial.
 HERB, M., Naples. Onions for trial.
 HILL, Dr. A. W., Kew. Seed of *Althaea setosa*.
 HILTON, Dr., British Columbia. Seed of *Erythronium grandiflorum*, *E. var. albiflorum*, *E. Smithii*.
 HORNIBROOK, M., Ripley. Cupressus with two forms of foliage.
 HURST & SON, Messrs., London, E. 1. Cauliflowers, Leeks, Beet, Lettuce Dwarf French Beans, Asters, Eschscholzas, for trial.
 INNSBRUCK BOTANIC GARDEN. Collection of seeds.
 INSOLE, Miss, Llandaff. Iris for trial.
 JASBY BOTANIC GARDEN. Collection of seeds.
 JERVELL, Miss. *Anemone nemorosa* Miss Low's var., Irish form of *Alstroemeria aurantiaca*.
 JOANNIDES, Mrs., Wimbledon. Collection of seeds.
 JOHN INNES HORTICULTURAL INSTITUTION, Merton. Grafts of Apple seedlings for trial.
 JOHNSON, L., Camden. Collection of Pelargoniums.
 JOHNSON, Messrs. W. W., Boston. Cauliflower for trial.
 JOHNSTONE, Miss E. M., West Clandon. Seeds from Alberta, Peace River District.
 JONES, E. MARSDEN, Devizes. *Saxifraga potternensis*, *Saxifraga rosacea* x *S. granulata*.
 JONES, H. J., Lewisham. Delphinium, Aster, for trial.
 JONES, Miss A. H., Ringwood. Seed of wild Poppy.
 JOYCE GREEN HOSPITAL, Dartford. Plants of *Spiraea trichocarpa*.

- KASSEL BOTANIC GARDEN. Seed of *Rosa Sayi*, *Dianthus avatolicus*, *Lychnis Haageana*.
- KAUNAS BOTANIC GARDEN. Collection of seeds.
- KELLY, Lady, Wellington. Bulbs of *Iris Sisyrrinchium*.
- KELWAY & SON, Messrs., Langport. Lettuce, Leeks, Asters, Beet, Dwarf French Beans, Cauliflowers, Delphiniums, Gladioli, Gaillardias, Onions, Cabbages, for trial.
- KENDREW, Miss, Peaslake. Seeds from Kenya.
- KENT, Mr., Balcombe. *Spartina juncea*.
- KEW BOTANIC GARDENS. Collection of seeds.
- KIEV BOTANIC GARDEN. Collection of seeds.
- KINGSLEY FRUIT FARM, Bordon. Strawberry for trial.
- KLINKENBERG & DE JONGS, Messrs., Naaldwijk. Cauliflowers for trial.
- KNIGHT BROS., Messrs., Botley. Strawberry for trial.
- KÖNIGSBERG BOTANIC GARDEN. Collection of seeds.
- KRAKOWIE BOTANIC GARDEN. Collection of seeds.
- LADHAMS, Messrs. B., Southampton. Gaillardias for trial.
- LAKELAND NURSERIES, THE, Windermere. Plant of *Pulmonaria azurea*.
- LAUSANNE BOTANIC GARDEN. Collection of seeds.
- LAXTON BROS., Messrs., Bedford. Black Currants, Plum, and Gooseberries for commercial trials.
- LEE, Mrs., Exeter. Plant of double red Primrose.
- LEENDERS & CO., M., Holland. Roses for trial.
- LEES, Lt.-Col., Maida Vale. Books for Library.
- LEIDEN UNIVERSITY BOTANIC GARDEN. Collection of seeds.
- LEIGHTON, J., Cape Province. Seed of *Bignonia capensis*.
- LEMAN, H. M., Nottingham. Three varieties of 'Four o'clock' *Mirabilis*, one Giant Sunflower, and one Melon from Johannesburg; one Persimmon.
- LEMPERG, Dr., Austria. Collection of seeds.
- LENINGRAD BOTANIC GARDEN. Collection of seeds.
- LENINGRAD INST. OF APP. BOTANY. Collection of seeds.
- LIGHTBODY, Dr., Sidmouth. Seed of blue and white Iris from Kashmir.
- LINZ BOTANIC GARDEN. Collection of seeds.
- LODER, G. W. E., Ardingly. Collection of seeds.
- LOFTHOUSE, T. A., Middlesbrough. Collection of seeds.
- LONG, E., Simla. Seed of *Paeonia Emodi*, *Lilium polyphyllum*, *Pyrus* sp.
- LUND BOTANIC GARDEN. Collection of seeds.
- LYON BOTANIC GARDEN. Collection of seeds.
- LYPTOL, LTD., Messrs., Harrow. Lypticide for trial.
- MCALPINE, A., Glasgow. Chrysanthemum for trial.
- MCGREDY & SON, Messrs. S., Portadown. Roses for trial.
- MCCLAREN, The Hon. H. D., Tal-y-Cafn. *Cupressus leptoclada*; Primula seeds.
- MCCRACKEN, General A. D., Vancouver. Dahlias for trial.
- MAGOR, E. J. P., St. Tudy. Seedlings of *Sollya heterophylla*.
- MARBURG BOTANIC GARDEN. Collection of seeds.
- MARSEILLES BOTANIC GARDEN. Collection of seeds.
- MARSHALL, Mrs. Stephen, Ambleside. Seed of *Notospartium Carmichaeliae*.
- MARTINEAU, Mrs., London. Seeds of *Agathaea* from Tangiers; *Salvia Sclarea*, Vatican var.
- MASON, Miss, Westminster. Bulbs of Watsonias.
- MAY, Lady, St. Tudy. Plants of pink Lily and red and yellow flower.
- MEITZ BOTANIC GARDEN. Seed of *Veronica austriaca multifida*, *Veronica elegans*.
- MIDDLEHURSTS, Messrs., Liverpool. Lettuce, Asters, Cauliflowers, for trial.
- MILNER, H. J., Birmingham. Chrysanthemums for trial.
- MITCHELSON, A., Womersley. Bean for trial.
- MODENA BOTANIC GARDEN. Collection of seeds.
- MONRO, Messrs. G., Waltham Cross. Drum of Winter Wash for trial.
- MOORE, Mrs., Cheltenham. Seed of *Wistaria multiflora*.
- MOORE, ARMYTAGE, Ireland. Seed of *Meconopsis Wallichii* blue and white, and *Meconopsis violacea*.
- MOORE, J. B., Leicester. Culinary Pea for trial.
- MORRIS, R. A., Birmingham. Gaillardias, Asters, Dwarf French Beans, Cauliflowers, Beet, Lettuce, Leeks, Cabbages, Onions, for trial.
- MORSE & CO., Messrs. C. C., U.S.A. Cabbages, Sweet Peas, for trial.
- MUNDEN BOTANIC GARDEN. Collection of seeds.
- MUNICH BOTANIC GARDEN. Collection of seeds.
- MUSEUM OF NATURAL HISTORY, Paris. Collection of seeds.
- MUSGRAVE, C. T., Godalming. Seed of *Salvia Laruli*, *Gentiana x hascombensis*, *Gentiana prolata*.

- MYERS, S., Teddington. *Asparagus Myersii*.
 NANCY BOTANIC GARDEN. Collection of seeds.
 NANTES BOTANIC GARDEN. Seed of *Saxifraga ajugaefolia*, *Rosa xanthima*, *Asclepias curassavica*.
 NATIONAL BOTANIC GARDENS, Kirstenbosch. Collection of seeds.
 NIX, C. G. A., Crawley. Cuttings of Black Currant for trial.
 "NUNHEM," Messrs., Holland. Cabbages for trial.
 NUTTING & SONS, Messrs., London. Dwarf French Beans, Cauliflowers, Lettuce, Seakale, Leeks, Beet, Asters, Cabbages, Onions, for trial.
 OLSEN, CHR., Denmark. Lettuce, Beet, Cauliflowers, Leeks, for trial.
 ORPINGTON NURSERIES, THE, Orpington. Irises for trial.
 OSLO BOTANIC GARDEN. Collection of seeds.
 OVERBECK, O., Salcombe. *Dracaena Banksii*.
 OXFORD BOTANIC GARDEN. Collection of seeds.
 PABST, CARL, Germany. Aster for trial.
 PEARSON & SONS, Messrs. J. R., Lowdham. Cabbage for trial.
 PENNELL & SONS, Messrs., Lincoln. Dwarf French Beans, Beet, for trial.
 PERRY, AMOS, Enfield. Iris for trial.
 PIKE, Mrs., Bishop's Waltham. Seed of *Polygonum paniculatum*; *Antigone* sp.
 POUPART, W., Walton. Grafts of Pear for trial.
 PREMEX PRODUCTS CO., Messrs., London. Tins of "Premex" Slug-killer and "Premex" Mildew Cure for trial.
 PROCTOR & SONS, Messrs. R. W., Chesterfield. Dahlia.
 RAYMENT, H. G., Harpenden. Delphinium for trial.
 RIABOFF, I. N., Crimea. Peaches for fruit trials.
 RICHARDS, I., Petersfield. Seed of *Nicotiana rustica*.
 RICHARDS, LTD., Messrs., London. Tin of "Nippon Ant Destroyer."
 RIVORE PÈRE & FILS, Messrs., Lyon. Lettuce, Leeks, Asters, for trial.
 ROGERS, F. A., Iraq. Seeds of unknown plant; a number of bulbs.
 ROME BOTANIC GARDEN. Collection of seeds.
 RYDER, The Hon. Mrs., Brockenhurst. Collection of seeds.
 SAPPORO BOTANIC GARDEN. Collection of seeds.
 SAUNDERS, A. P., New York. Pæonies for trial.
 SAUNDERS, L. H., Kingsbury. Seed of Lupin from Nigeria.
 SECRETET, F. A., Twickenham. Narcissi for trial.
 SEWELL, A. J., Weybridge. Plant of *Jankaea Heldreichii*.
 SHOESMITH, JUN., H., Woking. Chrysanthemums for trial.
 SIMPSON & SONS, Messrs. W. H., Birmingham. Lettuce, Beet, Cauliflowers, Leeks, Dwarf French Beans, Asters, Gaillardias, Potatoes, Cabbages, Onions, for trial.
 SLOCOCK, Messrs., Woking. *Rosa odorata*, *Rosa multiflora*, and unknown stock.
 SLUIS EN GROOT, Messrs., Eukhuizen. Onions, Cabbages, for trial.
 SMITH, R. Collection of seeds.
 SMURTHWAITE BROS., Messrs., North Shields. Cabbage for trial.
 SOFIA BOTANIC GARDEN. Collection of seeds.
 SPEED, H. J., Evesham. Dwarf French Beans, Leeks, Beet, Lettuce, Cauliflowers, Cabbage, for trial.
 SPENCER, W., Milford. Delphiniums for trial.
 SPINKS, G. T., Bristol. Cuttings of Black Currants and Raspberry canes; trees and grafts of seedling Apple for commercial trials.
 STAFFORD ALLEN & SONS, Messrs., London. Bottle of "Pysect Wash" for trial.
 STERNOL, LTD., Messrs., London. Sample of Emulsifiable Oil, Sternal Insecticide 7361 and 7362, for trial.
 STEVENSON, J. B., Ascot. Plants of *Primula helodoxa*.
 STEWART, D. B., U.S.A. Seed of *Salix Niobe* (weeping), *Sanguinaria*, *Anemone Pulsatilla*.
 STOCKHOLM BOTANIC GARDEN. Collection of seeds.
 STOKES & SON, Messrs., Trowbridge. Gaillardias for trial.
 STONOR, F., Southampton. Strawberry for trial.
 STORRS FOX, W., Bakewell. Delphinium for trial.
 STREDWICK & SON, Messrs., St. Leonards. Dahlias for trial.
 STUART & MEIN, Messrs., Kelso. Beet, Leeks, Cauliflowers, Cabbage, for trial.
 SUTTON & SONS, Messrs., Reading. Gaillardias for trial.
 TAUDEVIN, Mr., *Cistus purpureus*, Primulas, *Cheiranthus* x 'Newark Park.'
 TELFER, Miss, Ewhurst. Bulbs of *Allium Moly luteum*; seeds of *Dianthus deltoides*; Delphinium, Lupins, Sweet Williams.
 THOMSON, Dr. W., New Zealand. Collection of seeds.
 THOMSON, P. MURRAY, Hereford. Primroses for trial.

clxviii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

- THOMSON, W. W. M., New Zealand. Bulbs of *Narcissus Jonquilla* × *N. triandrus albus*.
- THORPE, A. W., Lichfield. Chrysanthemums for trial.
- THORPE, J. J., Hastings. Chrysanthemums for trial.
- TIFLIS BOTANIC GARDEN. Collection of seeds.
- TITCHMARSH, C. C., Bath. Grafts of Apple for trial.
- TODD, Col. ENEVER, Herne. *Wilkesia Grayana*.
- TOPSVOORT, W., Aalsmeer. Dahlias for trial.
- TRESEDER, W., Cardiff. Dahlias for trial.
- TRINITY COLLEGE BOTANIC GARDENS, Dublin. Collection of seeds.
- TROTTER, R. D., Ockley. Miscellaneous seeds and plants, some from the Cape; coriols of *Anemone pavonina*; seed of *Delphinium niveum*.
- TURNER, C., Slough. Dahlias for trial.
- UPSALA BOTANIC GARDEN. Collection of seeds.
- VANDERSCHOOT, Messrs. J. B., Hillegom. Gaillardia for trial.
- VAN EGMOND, W., Oegstgeest. Delphinium for trial.
- VAN TUBERGEN, Messrs. C. G., Haarlem. Chrysanthemums for trial.
- VEITCH & SON, Messrs. R., Exeter. Leeks, Beet, Lettuce, Cauliflowers, Scakale, Gaillardias, Asters, for trial; seed of Celery 'Veitch's Early Rose.'
- VELTHUYS, Messrs. K., Hillegom. Gladioli.
- VIENNA UNIVERSITY BOTANIC GARDEN. Collection of seeds.
- VILMORIN ANDRIEUX, Messrs., France. Collection of seeds.
- VOSS & Co., Messrs., Millwall. Samples of "Spidercane," "Bordorite," "Formavoss," for trial; carbon bisulphide for Laboratory.
- WAGENINGEN ARBORETUM. Collection of seeds.
- WALKER, Messrs., New Zealand. Rose 'Climbing Golden Emblem.'
- WALL, J. T., Wisley. Collection of seeds and plants.
- WALLER-FRANKLIN SEED Co., Guadalupe, California. Gaillardias, Asters, for trial.
- WALSHAW, Messrs., Scarborough. Gaillardia for trial. Variegated Aubrietia.
- WATKINS & SIMPSON, LTD., Messrs., London. Gaillardias, Asters, Dwarf French Beans, Beet, Cauliflowers, Leek, Lettuce, Cabbages, Onions, for trial. Turnip 'Golden Ball,' *Geranium zonale*, *Viola cornuta* 'White Gem' and 'Lavender Gem.'
- WATSON, L., Bognor. Seed of Yellow Indian Rose Anemone and Blue Passion Flower.
- WEBB & SONS, Messrs. E., Stourbridge. Potatos, Leeks, Dwarf French Beans, Beet, Lettuce, Cauliflowers, Cabbages, for trial.
- WELLINGTON, Mrs. R., Geneva. Grafts of Apples, Pears, and Cherries for trial.
- WESSTEIN, M. E., Holland. Tulips for trial.
- WESTON, T. A., U.S.A. Violas for trial.
- WEYER, Mr. VAN DER, Dorchester. Seed of *Iris foetidissima*, yellow form.
- WHEELERS LTD., Messrs., Warminster. Cabbages, Onions, for trial.
- WILKINSON, Mr., New Zealand. Collection of seeds.
- WILLIAMS, Dr. A. H., Horsham. Seed of *Arthropodium cirrhatum*, *Dierama pendulum roseum*.
- WOOD, Messrs. W., Taplow. Asters for trial.
- WOOLMAN, H., Shirley. Dahlia for trial.
- WRAY, C., Grayshott. Roots of *Zauschneria californica*.
- WYE AGRICULTURAL COLLEGE. Journals for Library.
- YATES & SON, Messrs., Evesham. Onions for trial.
- ZAGREBENSIS UNIVERSITY, JUGOSLAVIA. Collection of seeds.
- ZURICH BOTANIC GARDEN. Collection of seeds.
- ZWAAN & DE WILJES, Messrs., Holland. Cauliflowers, Beet, Cabbages, Onions, for trial.
- ZWAAN & VAN DER MOLEN, Messrs., Holland. Leeks, Dwarf French Beans, Lettuce, Beet, Cauliflowers, for trial.

INDEX.

The references in italics are to figures and illustrations.

- Abelia chinensis, 60
floribunda, 60
Abutilon megapotaamicum, 60
seedling, cxviii
Acacia decurrens, 55, 56
lophantha, 55
melanoxylon, 55
Acer Pseudoplatanus Nizettii, cxxix
Actinidia arguta, 59
chinensis, 59
coriacea, cxxxiii
Kolomikta, 59
polygama, 59
purpurea, 59
Adams, R. M., and G. L. Fisk, "A
Laboratory Manual of General
Botany," 158
Adenia globosa, 270
Adenocarpus decorticans, 60
Aegle sepiaria, 57, 60
African highlands, their flora, 266
Agrostis alba, cxix
stolonifera, cxix
canina, cxix
vulgaris, cxix
Akebia lobata, 59
quinata, 60
Alexander, H. G., on orchid growing, 72
Allium Cepa and eelworm, 93
cernuum, cxxxiii
flavum, A.M., cxxxii
Aloysia citriodora, 60
"Alpine Flowers," by G. Hegi,
reviewed, 285
Alsenosmia macrophylla, 108
Amateurs' Flower Show, lxxvii
"American Plants for American
Gardens," by E. A. Roberts and E.
Rehmann, reviewed, 157
Amorphophallus sp., 269
Ampelopsis, *see* Vitis
"Anatomy of Dessert," by E. A.
Bunyard, reviewed, 160
Anemone crispifolia, 122
hupehensis, 122
japonica, 122
"Mary Seton," A.M., xlix
pavonina 'Rosalie,' cxx
Anemones in Africa, 270
Angraecum sesquipedale, clx
Annobon, its flora, 266
Annual meeting, 1929, i
1930, lxxxvii
Ansellia congoensis, Witloy var., A.M.,
lxiii
Anthemis tinctoria, Perry's var., A.M.,
cxxx
Anthoxanthum odoratum and eel-
worm, 93
Anthurium Rothschildianum 'Excel-
sior,' A.M., xli
Anthyllis Barba-jovis, 60
Antirrhinum 'C. H. Herbert,' A.M.,
cxlii
glandulosum, cxxxviii
"Aphelenchen der Kulturpflanzen,"
by H. Goffart, reviewed, 297
Aponogeton leptostachyum, A.M., liii
Apple 'Epicure,' awarded Bunyard
Cup, cxxiv
'Howgate Wonder,' A.M., cxxv
seedlings, resemblance to
parent, cxviii
'Woolbrook Pippin,' A.M.,
cxxxvii
Apples, refrigeration, 66
Aquilegia canadensis, xxxvii
Aristolochia altissima, 59
heterophylla, 60
Sipho, 53, 55, 59
tomentosa, 59
Artemisia arborescens, 58, 60
gnaphaloides, cxvii
Arthropodium cirrhatum, 104
Arundo conspicua, 109
Aster adfinis, A.M., cxxix
tenellus, cxxxix
Astragalus utahensis, A.M., 1
Auchter, E. C., *see* Knapp, H. B.
"Australian Nature Studies," by J. A.
Leach, reviewed, 287
Autumn shows, lxxix, lxxxi, lxxxiii,
lxxxv
Award of Garden Merit, 121, 276
Azara Gilliesii, 60
integrifolia, 60
variegata, 60
microphylla, 53, 59
"Bacterial Metabolism," by M.
Stephenson, reviewed, 297
Balance Sheet, 1928, xv
1929, cvi
Bananas, refrigeration, 66
Bannut, 253

- Barnes, T. A., on flora of African highlands, 266
 Barton-Wright, E., "Recent Advances in Plant Physiology," 293
 Bauhinia yunnanensis, 60
 Beans, broad, awards, cxxii
 dwarf French, awards, xxxix, cxxiii
 ' Bounteous,' A.M., xxxix
 ' Canadian Wonder Improved,' A.M., xxxix
 ' Early Prolific,' A.M., xxxix
 ' Fifty Days,' A.M., xxxix
 runner, ' Tip-top,' A.M., cxxvi
 Beets, awards, cxxvi
 Begonia baccata, 268
 manicata, cxlix
 ' Mrs. Raeburn Mann,' A.M., lii
 mite attacks Browallia, cxvii
 with superior ovary, cxix
 Begonias in Africa, 266 *et seq.*
 Bellevalia mauritanica, xxxvii
 Berberidopsis corallina, 54, 56, 60
 Berberis Fremontii, 58
 verruculosa, 123
 Bews, J. W., "The World's Grasses," 159
 Bignonia capreolata, 59
 Billardiera longiflora, 60
 Blackberry albino, cxviii
 "Book of the Tulip," by Sir D. Hall, reviewed, 153
 Book reviews, 153, 281
 Bornet, E., on Cistus hybrids, 50
 Bose, Sir J. C., "Growth and Tropic Measurements of Plants," 288
 "Botany: a Text-Book," by W. J. Robbins and H. W. Rickitt, reviewed, 289
 Boulestin, X. M., and J. Hill, "Herbs, Salads and Seasonings," 295
 Brassacattleya x 'British Queen' var. 'Stonehurst,' A.M., clvii
 x 'Prince Olaf,' F.C.C., lxii
 x 'Springtide,' Stonehurst var., F.C.C., lxiv
 x 'Springtide' var. 'The Node,' F.C.C., lxiii
 x 'The Globe' var. 'Mrs. Simon Gay,' A.M., lxv
 Brassolaeliocattleya x 'Ambaurea,' F.C.C., clvii
 x 'Aprica' var. 'Aureole,' A.M., clii
 x flavida, Dell Park var., A.M., clxi
 x 'Golden Crown' var. 'John Band,' A.M., clv
 x 'Gordon Highlander' var. 'Majestic,' A.M., lxv
 x 'Heliolata,' F.C.C., clvi, clviii
 x 'Orange Glory,' A.M., lxv
 x 'Priapus,' Brockhurst var., A.M., clii
 x 'Queen Elizabeth,' F.C.C., clviii
 x 'The Duchess,' A.M., clv
 x 'Vashti,' A.M., lxi
 "Brief Course in Biology," by W. H. Wellhouse and J. O. Hendrickson, reviewed, 158
 Briscoe, T. W., "Orchids for Amateurs," 296
 British Violas, xxxvi
 Browallia speciosa, cxvii
 Brussels Sprouts 'Evesham Special,' A.M., 151, 152
 ' Spiral,' A.M., 149, 150
 tried at Wisley, 149
 Buddleia auriculata, 59
 Colvillei, 59, 61
 paniculata, 61
 superba rosea, cxvii
 variabilis, 55
 Buller, A. H. R., "Practical Botany," 288
 Bunyard Cup awarded, cxxiv
 Bunyard, E. A., "The Anatomy of Dessert," 160
 Bursaria spinosa, 54, 59, 61
 Büsgen, M., "The Structure and Life of Forest Trees," 290
 Cacao, 270
 Calamus sp., 268
 Calanthe x 'Stella,' F.C.C., clxi
 Calceolaria Benthami, A.M., lv
 biflora, A.M., lvi
 integrifolia, cxxxviii
 Sinclairi, 104
 uniflora, xxxvii
 Calendula flaccida, 276
 Tragus, 276, 277
 Callistemon coccineus, 61
 lanceolatus, 61
 salignus, 61
 Calluna vulgaris fl. pl., A.M., cxxxviii
 Searlei aurea, cxxix
 Caltha palustris plena, A.G.M., 277
 plurispala, 278
 polypetala, 278
 semiplena, 278
 polypetala, 278
 Calvert, A. F., "Daffodil Growing," 154
 Calvoa crassinode, 268
 Camellia, 54, 56
 cuspidata, 61
 japonica, 59
 albo-magnifica, 61
 reticulata, 59, 61
 Sasanqua, 61
 Campanula carpatica 'Chewton Joy,' A.M., cxxxi
 fragilis, cxxxiv
 Medium, 145
 mollis, cxxxiv
 persicifolia and eelworm, 93
 thessalica, cxxxiii
 Canterbury Bell 'Calycanthema Mauve,' A.M., 147
 White, A.M., 145, 146
 fl. pl. Rose Carmine, A.M., 146

- Canterbury Bell, Single Mauve, *A.M.*,
147
White, *A.M.*, 145
Bells tried at Wisley, 145
Cantua buxifolia, 61
Carnation 'Allwood's Prolific,' *A.M.*, cl
'Beauty of Cambridge,' *A.M.*,
cxxx
'Flambeau,' *A.M.*, lv
'Kathleen,' *A.M.*, xlii
'Thomas Ives,' *A.M.*, xli
'White Senator,' *A.M.*, cxlviii
Carpenteria californica, 58, 61
Carter, H. G., "Our Catkin-bearing
Plants," 298
Caryopteris Mastacanthus, 61
tangutica, cxl
Cassia corymbosa, 56, 59, 61
laevigata, 59
Cassinia leptophylla, 61
Vauvilliersii, 61, 105
Cattleya × 'Gladiator,' *A.M.*, cliv
× 'Gloriette' var. 'The Node,'
A.M., clviii
× 'Helioglow,' *A.M.*, clvi
× 'Horos,' *A.M.*, clvi
× 'Mimosa' var. 'Primrose
Queen,' *A.M.*, clvi
× 'Prince Shimadzu' var.
'King George,' *F.O.C.*, lcv
× 'Remy Chollet' var. 'Presi-
dent,' *A.M.*, lx
× 'Suavior' flammea, *A.M.*,
clx
× 'Susan' alba, *A.M.*, lxxv
Cauliflowers, awards, cxxvi
Ceanothus, 53
'Autumnal Blue,' *A.M.*, cxl
dentatus floribundus, 61
floribundus, 59
'Gloire de Versailles,' 58, 61
'Indigo,' cxl
papillosus, 58, 61
rigidus, 61
thyrsiflorus, 59, cxl
Veitchianus, 59, 61
Veitchii, 54
Celastrus sp., 55
Ceratostigma Griffithii, 58, 61
Polhillii, 61
Willmottianum, 61
Cestrum elegans, 61
fasciculatum, 61
Cetonia stictica, 52
Chamaerops excelsa, 280
Fortunei, 280
Chandler, W. H., "North American
Orchards," 158
Cheiranthus Allionii, eelworm, 93
Chelsea Show, xxxi
Cherry pollination, cxvi, cxviii, cxix
Chiliotrichum rosmarinifolium, *A.M.*,
lvi
Chimera in Helianthemum, xxxvii
Chimonanthus fragrans, 58, 61
Chittenden, F. J., on Award of Garden
Merit, 121, 276
Choisya ternata, 54, 58, 61
Chorizema varium, *A.M.*, cxlix
Chrysanthemum 'Arabella,' *A.M.*, cxlii
'Balcombe Bronze,' *A.M.*, cxlvi
'Balcombe Sunray,' *A.M.*, cxlvi
'Cavalier,' *A.M.*, cxli
'Chestnut,' *A.M.*, cxlv
'Dazzle,' *A.M.*, cxlii
'Florence Bigland,' *A.M.*, cxlii
'Hebe,' *A.M.*, cxlv
'Kenneth Hastie,' *A.M.*, cxlvi
'Kingcup,' *A.M.*, cxxxix
'Lido,' *A.M.*, cxl
'Mme. Gabrielle Thiaux,' *A.M.*,
cxlii
'Mrs. Sarah Knight,' *A.M.*, cxl
'Mrs. W. D. Cartwright,' *A.M.*,
cxxxix
'New Year,' *A.M.*, xli
'Snowflake,' *A.M.*, cxli
'Sundown,' *A.M.*, cxlv
'Thanksgiving Pink,' *A.M.*,
cxlvi
'Winnie Avery,' *A.M.*, cxxxv
'Yellow Monument,' *A.M.*, cxlv
"Chrysanthemums for Amateurs," by
A. J. Macself, reviewed, 294
Chrysopsis incana, cxviii
Cirsium occidentale Coulteri, *A.M.*,
cxxxix
Cistus, 1, 55
acutifolius, 30
Aguilari, 33, 34
Albereensis, 24, 32
albidus, 7, 8, 13, 16, 21, 23-6,
28, 30-2, 36, 38, 51, 52
albus, 9, 24, 38
× crispus, 36
× villosus, 8, 38
albinus, 9
ambiguus, 24, 38
Bourgeanus, 7, 19, 21, 22, 36, 37
canariensis, 29
candidissimus, 15, 22, 23
× canescens, 8, 9, 24, 28, 38
× canescens pallidus, 9
classification, 21
Clusii, 36
coeris, 29
complicatus, 28
× corbariensis, 5, 14, 32, 33, 41,
42
corsicus, 26
× Costei, 32, 35, 48
creticus, 26, 51
× crispatus, 25, 28, 38, 39
crispus, 3, 13, 15, 21, 24, 26, 32,
35, 36, 38, 51
vestitus, 25
× villosus, 25, 38
cultivation, 19
cymosus, 29, 36
× cypricus, 10, 13, 20, 33-5, 46, 48
albus, 49
immaculatus, 49
× Delilei, 15, 24, 36
distribution, 3, 19
feredjensis, 43
florentinus, 12, 15, 30, 32, 43
flowers spotted, 10
Gaultieri, 24, 32

Cistus × *glaucus*, 30, 35, 45, 46
hardiness, 5, 30
 × *heterogenus*, 11
heterophyllus, 13, 19, 21, 24, 25, 28, 35
 × *Hetieri*, 13, 30, 34, 35
hirsutus, 7, 8, 21, 24, 30-5, 41, 43, 47, 51, 52
 × *ladaniferus*, 48
 × *monspeliensis*, 8, 43
 × *populifolius*, 41
 × *salvifolius*, 40
hybrids, 5, 10-12, 19, 24, 25, 28, 29, 50
hybridus, 15, 41
immaculatus, 34, 45, 48, 49
incanus, 26, 38, 51
labdanus, 4
ladaniferus, 4, 7, 10, 13, 19, 21, 22, 28, 30-5, 38, 40, 45, 47-9, 51, 52
albiflorus, 49
 × *hirsutus*, 47
immaculatus, 10
 × *laurifolius*, 48
 × *villosus*, 38, 40
lanuginosus, 15, 41
laurifolius, 3, 4, 7, 13, 19, 21, 22, 28, 30-6, 45, 47, 49, 51
atlanticus, 19, 35
 × *monspeliensis*, 46
 × *villosus*, 40
 × *laxus*, 15, 31, 33, 41, 42
Ledon, 17, 45
longifolius, 45
 × *Loretii*, 5, 10, 15, 28, 30, 34, 45-7
lusitanicus, 16, 31, 34, 47
decumbens, 16, 46, 47
marianus, 33
mauritanicus, 26
monspeliensis, 5, 8, 10, 12-14, 19, 21, 22, 24, 28, 29, 31-5, 40, 45, 47, 51
 yellow, 9
narbonnensis, 33
 × *Neyrautii*, 13, 30, 32, 34
 × *nigricans*, 30, 33, 41, 45
nomenclature, 14
 × *novus*, 25, 32
oblongifolius, 31, 35
obtusifolius, 31, 32, 40
angustifolius, 41
ochreateus, 20, 21-3
olbiensis, 43
osbeckiaefolius, 21-3
parviflorus, 12, 21, 22, 28, 30, 40
albiflorus, 29
 × *monspeliensis*, 40
 × *Pechii*, 48
pilosepalus, 8
platysepalus, 8, 30, 31, 43, 44
polymorphus, 26
 × *Ponsii*, 30, 32, 33
populifolius, 7, 14, 19, 21, 30, 31, 32, 34, 36, 41, 42, 51, 52
lasiocalyx, 33
 × *monspeliensis*, 13, 45

Cistus *porquerollensis*, 43
Pouzolzii, 16
 × *pulverulentus*, 13, 15, 24, 25, 36
 × *purpureus*, 10, 25, 38, 40
recognitus, 10, 16, 28, 41, 45, 47, 48
reghaiensis, 12
rosmarinifolius, 7, 21, 36
rotundifolius, 31
salvifolius, 4, 7, 11-14, 19, 21, 24, 25, 30, 31, 33-5, 40-2, 48-52
 × *Halimium*?, 49
 × *ladaniferus*, 48
 × *laurifolius*, 48
 × *monspeliensis*, 8, 43
 × *populifolius*, 41, 43
 yellow, 9
 self-sterility in, 7
 sensitiveness of stamens, 18
sericeus, 7, 9, 21, 25, 35, 36, 51
 × 'Silver Pink,' 35, 40
 × *Skanbergi*, 12, 20, 30, 40
Souliei, 48, 49
 × 'Sunset,' 15
symphytifolius, 21-3
hirsutissimus, 23
leucophyllus, 22
tauricus, 26
vaginatus, 5, 7, 19, 22, 23, 51, 52
varius, 16, 19, 21, 29
Verguinii, 32, 34, 48
villosus, 4, 8, 10, 13, 15, 21, 24-7, 29, 30, 35, 36, 38, 40, 51
 albus, 28
creticus, 4, 13, 28
 albus, 9, 28
incanus, 13
rotundifolius, 26
undulatus, 26
 'Warley Rose,' 15
 white-flowered, 16
 × *wintonensis*, 11, 49
Citrange 'Colman,' 57, 61
 'Morton,' 57, 61
 'Savage,' 57, 61
 Clay cup competition, lxxviii
Clematis, 55
albo-luxurians, 56
alpina, 61
Armandi, 59
aromatica, 59, 61
balearica, 56, 59
calycina, 53, 59, 61
chrysocoma, 61
cirrhuosa, 56, 59
concinna, 61
Davidiana, cxvii, cxviii
Flammula, 55, 59
indivisa, 56, 59, 61
lobata, 61
 its sudden death, cxvii
 × *Jouiniana*, cxviii
lobata, 59
montana, 54, 55, 59
platypetala, 59

- Clematis montana*, rubens, 59
 Wilsonii, 59, 61
 orientalis, 57, 59, cxviii
 paniculata, 59
 parviflora, 59
 Prattii, 61
 tangutica, 56, 57, 61, cxviii
 Vitalba, 55, cxviii
 Viticella, 55, 59
 albo-luxurians, 59
 rubra, 56, 59, 61
Clanthus puniceus, 54, 59
 albus, 59
Clivia 'Ursula,' A.M., xlv
 Clover in Africa, 270
Cocculus, 55
Coelogyne Mooreana, Westonbirt var., clx
 "Commercial Tomato Culture," by J. W. Craig, reviewed, 291
 Committee, Floral, xli, cxxi
 Fruit and Vegetable, xxxviii, cxxi
 Narcissus and *Tulip*, lxxvii
 Orchid, lix, clii
 Scientific, xxxv, cxvi
 Conger, G. P., "New Views of Evolution," 289
Cordylina, 104
Coriaria japonica, cxxxiii
Cornus Mas, A.M., cxi
Corokea macrocarpa, 61
Coronilla glauca, 61
Correa speciosa Harrissii, 61
Corylopsis, 54
 Griffithii, 61
 Willmottiae, 58, 61
Cosmos bipinnatus, early-flowering, cxvii
Costus gigantea, 268
Cotoneaster horizontalis, 58, 61
 variegatus, 61
 microphylla, 61
 multiflora callicarpa, A.M., cxliii
 Cox, E. H. M., "Wild Gardening," 294
 Craig, J. W., "Commercial Tomato Culture," 291
Crassula sarcocaulis, A.M., cxxxvi
Crataegus glandulosa, cxi
 monogyna, xxxvii
 kyotostyla, xxxvii
 laciniata, xxxvii
 pteridifolia, xxxvii
 rust, cxvi
Crinum natans, 268
 "Cut Flowers for Market," by F. J. Fletcher, reviewed, 295
Cyananthus Farreri, A.M., cxxix
 Cycads, 268
Cyclamen Rohlfsianum, B.C., cxix
Cynoches Loddigesii, A.M., clvii
Cydonia japonica, 54, 61
 alba grandiflora, 61
 cardinalis, 61
 nivalis, 61
 princeps, 61
 versicolor, 61
 Maulei, 58, 61
 alba, 61
Cydonia Maulei, *atrosanguinea*, 58, 61
 Sargentii, 58, 61
Cymbidium atropurpureum, B.C., cxvi
 × 'Gold Crest,' F.C.C., lxi
 × 'Letty,' Wyld Court var., F.C.C., lx
 × 'Marabou' var. 'Exbury,' A.M., lxii
 × 'Morvyth,' Exbury var., A.M., lx
 × 'Pearl' var. *magnificum*, F.C.C., clxi
 × 'Pipit' var. 'Mandarin,' A.M., lxi
 × 'Plover,' Wyld Court var., A.M., lxii
 × 'Puffin' var. 'Calypso,' A.M., lxii
 × 'Ralph Sander,' Old Quarry var., A.M., lxi
 × 'Rosanna,' A.M., lx
 × 'Rosy Queen,' A.M., clxii
 × 'Venus' var. 'Diome,' A.M., clxii
 × 'Vesta,' A.M., lx
 sanguinolentum, A.M., lxii
Cynoglossum nervosum, A.M., lvi
Cyperus Braunii, cxxxix
 paramattensis, cxxxix
Cypripedium × 'Albania,' F.C.C., cliii
 bellatulum var. 'King George V.' A.M., lxxv
 × 'Dicker,' Stonehurst var., A.M., clx
 × 'Gertrude West,' A.M., clxii
 × 'Grace Darling,' A.M., clii
 × 'Jungfrau,' Brockhurst var., F.C.C., clii, clxx
 × 'Lady Stanton,' Chardwar var., A.M., clxi
 × 'Littlecot,' A.M., clii
 × 'Llanccayo,' A.M., clxx
 malformed, xxxvi
 × 'Mecca' var. 'Mrs. W. J. P. Marling,' A.M., clx
 × 'Midas' var. 'The King,' A.M., clx
 × 'Nena' var. 'The Queen,' A.M., clx
 × 'Strombole,' F.C.C., clii
 × 'Windrush' var. 'Menteith,' A.M., clii
Cytisus fragrans, 61
 elegans, 61
 Hildebrandtii, 61
 monspessulanus, 61
 "Daffodil Growing," by A. F. Calvert, reviewed, 154
 Daffodil Show, 1929, xxx
 Dahlias tried at Wisley, 1929, 125
Daphne Mezereum, 121
 grandiflora, 121
 tangutica, A.M., liii
Daucus Carota, xxxv
 Davidson, H. C., "Fruit Culture," 155

- Decumaria barbara, 61
 Delphinium 'Ann Baker,' A.M., cxxxi
 'Cambria,' A.M., cxxxii
 candidum, 270
 'Countess Cowley,' 121
 'Dawn,' A.M., cxxxii
 eelworm, 93
 'Lady Eleanor,' 121
 'Lady Irene,' 124
 'Lady May,' 120
 'Mrs. Newton Lees,' A.M., cxxxii
 'Philip Butler,' 125
 'Sir Douglas Haig,' A.M., cxxxii
 Delphiniums, 114
 double, 116, 117
 eye varieties, 120
 Dendrobium × 'Prince Arthur' var.
 'Colossus,' A.M., lxv
 Dendromecon rigidum, 54, 55, 59, 61
 Deputation to Dublin, lxxviii
 Norwich, lxxvii
 Desmodium tiliaefolium, 61
 Dianthus × Allwoodii 'Prudence,'
 A.M., xlix
 deltoides plenus, cxxxii
 eelworm, 93
 Dickinson, L. S., "The Lawn," 292
 Digitalis ambigua dialysed, cxvi
 Dillistone, G., "Dykes on Irises," 284
 Dimorphotheca aurantiaca, A.G.M.,
 276
 Tragus, 277
 Dodecatheon Meadia 'Brilliant,' A.M.,
 liii
 Donations to Wisley, 1929, clxiii
 Draba aizoides, xxxvi
 "Dykes on Irises," by G. Dillistone,
 reviewed, 284
 Dykes, W. R. and E. K., "Notes on
 Tulip Species," 282
- Eames, E. A., *see* Morris, F.
 Eccremocarpus scaber, 61
 Eelworm disease of Phlox, 88
 Elaeagnus pungens aureo-variegata, 59
 umbellata, cxl
 Elscholtzia, 55
 Elwes, H. J., "Memoirs," 281
 Entelea arborescens, 108
 Epidermis, ash, cxx
 Ercilla volubilis, 59
 Erica australis 'Mr. Robert,' A.M., xli
 carnea 'Springwood White,'
 A.M., cxlix
 ciliaris, cxx
 tetralix, cxx
 × Watsonii, cxx
 Eriobotrya, 55
 Erysiphe Cichoracearum, cxviii
 Erythraea venusta, cxxxiv
 Escallonia × exoniensis, 59
 × langleyensis, 61
 macrantha, 53, 59
 montana, 61
 montevidensis, 59
 organensis, 59, 61
- Escallonia Philippiana, 59
 pterocladon, 59
 rubra, 58, 61
 Eucalyptus, 103
 Eucryphia Billardieri, cxxxiii
 Euonymus fimbriatus, 61
 lancifolius, A.M., cxliii
 radicans, 61
 'Silver Gem,' 58, 61
 yedoensis, cxl
 Euphorbia fulgens, F.C.C., calvii
 "Everyman's Encyclopaedia of
 Gardening," by W. P. Wright, re-
 viewed, 287
 Exochorda Albertii macrantha, 61
 Giraldii, 59
 Wilsonii, 59
 macrantha, 59
 racemosa, 61
- Fabiana imbricata, 61
 Farthing, F. H., "Saturday in My
 Garden," 287
 Feijoa Sellowiana, 61
 Fendlera rupicola, 61
 Fernando Po, its flora, 266
 Festuca ovina, cxix
 firmula, cxix
 hispidula, cxix
 varieties, cxix
 Fisk, G. L., and R. M. Adams, "Labo-
 ratory Manual of General Botany,"
 158
 Fletcher, F. J., "Cut Flowers for
 Market," 295
 "Flower and Vase," by A. Lamplugh,
 reviewed, 159
 Flower refrigeration, 70
 "Flowers and Trees of Palestine," by
 A. A. Temple, reviewed, 288
 Foremarke Challenge Cup, lxxix
 "Forests and Mankind," by C. L.
 Pack and T. Gill, reviewed, 291
 Forsythia atrocaulis, 59, 61
 suspensa, 53, 59
 Forsythias, 54
 Fox, H. M., "Patio Gardens," 160
 Freesia 'Beauty,' A.M., xlv
 'Maryon,' A.M., xlv
 'Mrs. R. F. Felton,' A.M., xlv
 Fremontia californica, 61
 mexicana, 61
 Fritillaria karadaghensis, xxxv, xxxvi
 Frost damage, xxxvii
 Fruit and Vegetable Show, lxxxiii
 "Fruit Culture," by H. C. Davidson,
 reviewed, 155
 Fruit Show, Imperial, lxxxv
 Fruit tree stocks, 169
 trees, xxxvii
 Fruits, soft, refrigeration, 68
 Fuchsia corallina, 61
 corymbiflora, A.M., cxxxiv,
 cxlvii
 fulgens, cxxxiv
 macrostemma, 54, 58, 61
 procumbens, 105

- Gaillardias at Wisley, 1929, 141
 Galanthus Elwesii, cxx
 Whittallii, cxx
 Garnett, F. E., on refrigeration, 64
 Garrya elliptica, 59
 Gentiana corymbiflora, cxxxvi
 × hascombensis, A.M., cxxxii
 hexaphylla, A.M., cxxxi
 Lagodechiana, cxxxiii
 Hascombe var., A.M.,
 cxxxiii
 prolata, A.M., cxxxiv
 Geraniums in Africa, 270
 Gilia californica, cxxix
 Gill, T., *see* Pack, C. L.
 Gladiolus 'Adoration,' A.M., cxxxv
 Blackwellii, A.M., cxliii
 'Capt. Boynton,' A.M., cxxxv
 chimera, cxviii
 eelworm, 93
 'Emma,' A.M., cxxxv
 'Gladness,' A.M., cxxxv
 'Harmony,' A.M., cxxxv
 'La Gaieté,' cxxxvi
 'Mrs. Unwin,' A.M., cxxxv
 'Ne Plus Ultra,' cxxxvi
 'The Queen,' cxxxvi
 "Gnetales," by H. H. W. Pearson, re-
 viewed, 291
 Goatsbeard, 'Hen and Chickens,' cxvi
 Godetia 'Tall Double Cherry Red,'
 cxxxvi
 Godwin, H., "Plant Biology," 296
 Goffart, H., "Der Aphelennen der
 Kulturpflanzen," 297
 Golden hop, 55
 Gongora maculata, A.M., clvi
 Gordonia anomala, A.M., xliii
 axillaris, A.M., cxliii
 Grammatocarpus volubilis, lvi
 "Growing Trees and Small Fruits," by
 H. B. Knapp and E. C. Auchter,
 reviewed, 286
 "Growth and Tropic Measurements of
 Plants," by Sir J. C. Bose, reviewed,
 288
 Gymnosporangium clavariaeforme, cxvi

 Haastia, 104
 Habenaria Lugardii, A.M., clvii
 Habranthus Bagnoldii, cxvii
 Halimicistus × heterogenus, 11, 32
 × Sahucii, 11, 32, 49
 × wintonensis, 32, 49
 Halimium algarvense, 3, 50
 formosum, 3, 32, 50
 halimifolium, 11, 32
 libanotis, 36
 ocymoides, 50
 rosmarinifolium, 36
 umbellatum, 32, 49
 Hall, Sir D., "The Book of the Tulip,"
 153
 Hatton, R. G., on stock and scion
 relations, 169
 "Hausgarten Technik," by K. Poethig
 and C. Schneider, reviewed, 160
 Hebe Allanii, 100

 Hedera argentea elegans, 61
 aurea densa, 62
 caenwoodiana, 62
 aurea, 62
 canariensis azorica, 59
 colchica, 59
 dentata, 59
 Helix lobata major, 59
 marginata major, 59
 palmata aurea, 59
 purpurea, 59
 hibernica, 60
 fol. argentea, 60
 maderensis, 59
 marginata aurea, 62
 'Mrs. Pollock,' 62
 'Silver Queen,' 62
 tricolor gracilis, 62
 Hedychium Gardnerianum, A.M.,
 cxxxvi
 Hegi, G., "Alpine Flowers," 285
 Helenium 'Wyndley,' A.M., cxxxv
 Helianthemum, chimera in, cxxxvi
 Helichrysum rosmarinifolium, 59, 62
 Heliophila longifolia, A.M., lvi
 Helleborus lividus, A.M., ci
 Hendrickson, J. O., and W. H.
 Wellhouse, "Course in Biology,"
 158
 "Herbs, Salads and Seasonings," by
 X. M. Boulestin and J. Hill, reviewed,
 295
 Hibiscus diversifolius, 108
 syriacus, 62
 Hill, J., *see* Boulestin, X. M.
 Hippeastrum bicolor, cxix
 'Lady Juliet Duff,' A.M., xlix
 Holboellia latifolia, 55, 60
 "Host Index of the Fungi of N.
 America," by A. B. Seymour, re-
 viewed, 156
 "How to Grow Roses," by R. Ryle,
 J. H. Macfarlane and G. A. Stevens,
 reviewed, 289
 Hyacinth, detached inflorescence,
 xxxvii
 sectorial chimera, xxxvi
 Hyacinths, 71
 Hydrangea petiolaris, 60
 villosa, cxxxiii
 Hypericum chinense, 62
 Hookerianum, 62
 Leschenaultii, 62

 Indigofera Dosua tomentosa, 62
 macroptera, 62
 rubra violacea, 54, 62
 Iris 'Abdera,' A.M., 135, 136
 'Aphrodite,' A.M., 137
 'Benbow,' A.M., 136
 'Blue Chintz,' A.M., 132, 133
 'Bluet,' A.M., 136, 137
 'Bruno,' A.M., 137, 138
 'Centurion,' A.M., 135
 'Flaming Sword,' A.M., 140, 141
 'Flutterby,' A.M., 140
 foetidissima, yellow-seeded, cxix

Iris 'Gold Imperial,' A.M., 140
 'Harmony,' A.M., 136
 'Hemodus,' A.M., 137
 'India,' A.M., 135
 'Iris King,' A.M., 139
 'Lent A. Williamson,' A.M., 135
 'Lord Lambourne,' A.M., 138, 140
 'Mlle. Yvonne Pelletier,' A.M., 136
 'Mrs. H. F. Bowles,' A.M., 139
 'Mrs. Marion Cran,' A.M., 137
 'Nemoralia,' A.M., 137
 'Norma,' A.M., 136
 'pallida dalmatica,' A.M., 136
 Shotsham var., A.M., 136
 'Parc de Neuilly,' A.M., 136
 'Rhein Traube,' A.M., 134, 136
 'Rialgar,' A.M., 139
 'Romola,' A.M., 135
 'Sir Michael,' A.M., 134
 'Souvenir de Mme. Gaudichau,' F.C.C., 135
 'Yeoman,' A.M., 133, 134
 Irises, 71
 bearded, at Wisley, 132
 Itea ilicifolia, 62
 virginica, 62
 Ivies, 53
 small-leaved, 58
 Ivy, dwarf varieties, cxix
 Ixora lutea, A.M., cxxxviii

Jasminum dianum, 62
 nudiflorum, 54, 60
 Sieboldianum, 62
 officinale, 53, 60
 grandiflorum, 60
 primulinum, 62
 revolutum, 60
 Juglans californica, 257, 258, 265
 Hindsii, 257
 cinerea, 245, 258, 259, 265
 cordiformis, 245, 258, 259
 kamaonia, 257, 259
 mandschurica, 265
 nigra, 245, 257, 265
 'Paradox,' 257, 265
 regia, 244, 257-9, 265
 maxima, 253
 praeparturiens, 257
 'Royal,' 257, 265
 Sieboldiana, 245, 258, 259

Juncus bufonius, xxxv
 Juniperus communis, chlorosis in, cxix
 montana, cxix
 nana, cxix
 seedlings, cxix

Kadsura japonica, 62
 Knapp, H. B., and E. C. Auchter:
 "Orchard and Small Fruit Culture," 155
 "Growing Trees and Small Fruits," 286
 Knightia excelsa, 108

"Laboratory Manual of General Botany," by G. L. Fisk and R. M. Adams, reviewed, 158
 Lachnus salicis, cxix
 Ladanium, 33
 Laeliocattleya × 'Aconcagua,' Dell
 Park var., F.C.C., clii
 × 'Berenice,' A.M., lxv
 × 'Cassandra,' A.M., clviii
 × 'Cavalese' excelsa, A.M., clvii
 × 'Cavalese,' Stonehurst var., A.M., clv
 × 'Edzell' var. 'Majestic,' A.M., clxi
 × Hassallii, Arddarroch var., A.M., lxvi
 × 'Ishtar' magnifica, A.M., clvi
 × 'Moloch' var. 'Stromboli,' A.M., clix
 × 'Profusion,' Stonehurst var., A.M., clv
 × 'Queen Mary' var. 'Crimson Glory,' F.C.C., clv
 × 'Queen Mary,' Stonehurst var., F.C.C., clviii
 × 'Sargon' var. 'Vesuvius,' F.C.C., cliv
 × 'Sunbelle,' Brockhurst var., F.C.C., lx
 × 'Titymoma,' F.C.C., lxii
 × 'Titymoma' rotunda, A.M., cliv
 × 'Titymoma,' Stonehurst var., F.C.C., clv
 × 'Vega,' A.M., lxi
 Lamplugh, A., "Flower and Vase," 159
 "Landscaping the Home Grounds," by L. W. Ramsay, reviewed, 286
 Langdon, C. F., on Delphiniums, 114
 Lapageria alba, 57
 rosea, 57, 62
 Lapeyrousia grandiflora, A.M., cxxxix
 Lardizabala bitermata, 55, 60
 Larkspur 'Exquisite Pink Improved,' A.M., cxxxv
 'Exquisite Rose,' A.M., cxxxv
 'La France,' A.M., cxxxvi
 Lathyrus magellanicus, A.M., lvi
 Lavender, shab disease, 271
 Lawn grasses, cxix
 "Lawn, The," by L. S. Dickinson, reviewed, 292
 Leach, J. A., "Australian Nature Studies," 287
 Leeks, awards, cxxxviii
 Leptospermum scoparium, 105
 Leptospermums, 62
 Leucocoryne ixioide odorata, A.M., xlvii
 Lewisia pygmaea, A.M., lvi
 Liatris graminifolia, cxxxix
 punctata, cxxxix
 Libertella fagina, cxviii
 Ligustrina yunnanensis, cxviii
 Lilium candidum, 71
 Henryi, cxxxvi

- Lilium longiflorum*, 70
 philippinense formosanum,
 Price's var., A.M., cxxxviii
Lily of the Valley, 70
Linaria vulgaris prolifera, cxvii
Lippia citriodora, 59, 62
Lissochilus speciosus, A.M., lxxv
Livingstone, A. E., "Your Flower
 Garden," 157
Loasa acanthifolia, A.M., lii
Lobelia in Guinea, 267
 'The Marvel,' A.M., lvii
 thomensis, 269
Loder, G. W. E., 1
Lonicera amoena, cxviii
 Caprifolium, 60
 ciliosa, 62
 etrusca, 60
 fragrantissima, 58, 62
 Giraldii, 62, cxxxix
 Heckrothii, 62
 Hendersonii, 62
 italica, 60
 japonica, 60, 62
 aureo-reticulata, 62
 Halliana, 62
 nitida, cxviii
 Periclymenum, 60
 sempervirens, 60, 62
 minor, 62
 Standishii, 58, 62
 tragophylla, 60, 62
Luculia Pinciana, A.M., cxlvii
Lupinus in Africa, 270

Macfarlane, J. H., *see* Ryle, R.
Macself, J. A., "Chrysanthemums for
 Amateurs," reviewed, 294
Madonna Lily, 121
Magnolia × *Brozzonii*, F.C.C., liii
 Campbellii, 40
 Delavayi, 60
 grandiflora, 60
 Watsonii, 62
 Wilsonii, 54, 62
Mahonia Fremontii, 58, 62
 haematocarpa, 62
 japonica, 62
 nepalensis, 58, 62
 trifoliata, 62
Malesherbia linearifolia, cxxxi
Mallows in Africa, 270
Mandevilla suaveolens, 60, 62
 "Manual of Mendelism," by J. Wilson,
 reviewed, 158
Marica gracilis, A.M., xlviii
Marssonina juglandis, 249
Masters lectures, 1929, 169
Meconopsis regia, cxx
Medicago arborea, 62
Meetings, Annual, i, lxxxvii
 General, i, lxxvii
 "Memoirs of Travel, Sport, and
 Natural History," by H. J. Elwes,
 reviewed, 281
Menispermum, 55
Mentha aquatica, cxvii
 subglabra, cxvii

Mentha longifolia, cxviii
 rotundifolia, cxviii
Mertensia miltkoides, A.M., l.
Metcalf, C. R., on shab disease of
 lavender, 271, 273
Metrosideros lucida, 62
 tomentosa, 108
Miltonia × *Bleuana* 'Langley Beauty,'
 A.M., cliv
 × *gatttonensis*, Exbury var.,
 F.C.C., cliv
 × 'Lucia' var. 'Molly Pater-
 son,' F.C.C., lxii, lxiii
 × 'Lycaena,' Orchidhurst var.,
 F.C.C., lix
 × 'Lydia' var. 'Regina,' A.M.,
 clix
 × 'Memoria H. T. Pitt' var.
 exquisita, cliv
 × 'Memoria H. T. Pitt,' Stone-
 hurst var., A.M., clx
 × 'Nadia' var. 'Helen Pater-
 son,' A.M., lxii
 × *pulchra* var. 'Enchantress,'
 A.M., clviii
 × *pulchra* var. 'Lyoth,' F.C.C.,
 clix
 × 'T. B. Armstrong,' F.C.C.,
 lxv
 × 'William Pitt,' Baron Schrö-
 der's var., F.C.C., lxiv
Mimosa, 103
Mitella Breweriana, cxvii
Mitraria coccinea, 62
 "Modern Fruit Growing," by W. P.
 Seabrook, reviewed, 154
Monarda didyma, cxvi
 hybrids, cxvi
 Russelliana, cxvi
 violacea, cxvi
Moore, Sir F. W., on wall plants, 53
Mormodes Garnettii, cxx
Morris, F., and E. A. Eames, "Our
 Wild Orchids," 285
Muehlenbeckia complexa, 60
Muehlenbeckias, 55
Mutisia Clematis, 62
 decurrens, 55, 62
Myosotidium hortense, 104
Myrtus Bidwillii, 62
 communis, 59, 62
 fl. pl., 59, 62
 fol. var., 62

Narcissi, 71
Narcissus 'Adventure,' A.M., lxix
 'Beersheba,' A.M., lxix
 'Bridegroom,' A.M., lxix
 cernuus plenus, xxxviii
 eelworm, 93
 'Fanny Currey,' A.M., lxxvii
 'Finality,' A.M., lxxi
 'Golden Ingot,' A.M., lxxviii
 'Huon,' A.M., lxx
 'Khatmandu,' A.M., lxxi
 'May Glory,' A.M., lxxi
 'May Malony,' A.M., lxix
 'Recessional,' A.M., lxx

- Narcissus 'Solleret,' A.M., lxix
 'Sunstar,' A.M., lxix
 'Triplex,' A.M., lxix
 'Whiteley Gem,' A.M., lxviii
 with upright flower, xxxvii
 "Nature round House and Garden,"
 by W. P. Westell, reviewed, 156
Nerine filiformis, cxxxix
Neviusia alabamensis, 62
 "New Views of Evolution," by G. P.
 Conger, reviewed, 289
 New Zealand plants, 101
 Nicholls, Sir H. A., "Textbook of
 Tropical Agriculture," 156
Nierembergia frutescens, cxviii
 "North American Orchards," by
 W. H. Chandler, reviewed, 158
 Notes and abstracts, alphabetically
 arranged, 162, 299
 "Notes on Tulip Species," by W. R.
 and E. K. Dykes, reviewed, 282
- Odontioda* × 'Acis' var. 'Radiant,'
 A.M., lx
 × 'Bluebell,' A.M., lxiii
 × 'Cardinal Mercier,' A.M., lxiii
 × 'Gwentara,' A.M., lxix
 × 'Laura,' Exbury var., F.C.C.,
 lxv
 × 'Leeana' var. 'Vivid,' A.M.,
 lxv
 × 'Marie Antoinette' excelsa,
 A.M., lxix
 × 'Mary Holmden,' A.M., clxii
 × 'Matador,' A.M., lx
 × 'Prince Olaf,' F.C.C., lxv
 × 'Velasquez,' A.M., lxii
 × 'Zarina' var. 'Brilliant,'
 A.M., lxv
- Odontoglossum* × 'Dusky Emperor,'
 A.M., clx
 × 'Eldorado,' Claygate Lodge
 var., F.C.C., clii
 × 'Harold' var. 'Distinction,'
 A.M., lx
 × *harvengtense* var. 'Wyld
 Court,' F.C.C., clxi
 × *mirum aureum*, A.M., lix
 × 'Purple Empress,' A.M., clii
 × 'Vandalia,' A.M., clxi
 × 'Zenon' var. 'Isobel,' P.C.,
 clviii
- Odontonia* × 'Olga' var. 'The
 Premier,' A.M., clx
- Oenothera* eelworm, 89, 93, 96
Fraseri, 89
taraxacifolia, cxvii
trichocalyx, A.M., lviii, cxii
Youngii, 93
- Olearia*, 104
Avicenniaefolia, 113
macrocephala, 59, 63
macrodonta, 101
- Omphalogramma Soulei*, A.M., cxlvi
Ophrys aranifera, xxxvi
 "Orchard and Small Fruit Culture,"
 by E. C. Auchter and H. B. Knapp,
 reviewed, 155
- Orchid growing, 72
 Show, lxxxv
 "Orchids for Amateurs," by T. W.
 Briscoe, reviewed, 296
Osteomeles anthyllidifolia, 62
 "Our Catkin-bearing Plants," by
 H. G. Carter, reviewed, 298
 "Our Wild Orchids, Trails and
 Portraits," by F. Morris and E. A.
 Eames, reviewed, 285
Ourisia alpina, A.M., liii
Oxalis geminata, cxxxiv
- Pachystegia insignis*, 104
 Pack, C. L., and T. Gill, "Forests and
 Mankind," 291
Paeonia Mlokosewitschii, A.M., liii
Pæonies, 71
Paliurus, 55
 Palms in Guinea Is., 267
Papaver hybrids, cxviii
pilosum, cxviii
Rhoeas, cxviii
 'New Double Queen,'
 A.M., cxxxii
rupifragum, cxviii
somniferum 'Taplow Pink,'
 A.M., cxxxii
- Passiflora coerulea*, 60
 'Constance Elliott,' 60
 "Patio Gardens," by H. M. Fox,
 reviewed, 160
Pear 'Doyenné du Comice,' pollina-
 tion, cxvi
 'Fertility' pollination, cxvi
 Pearson, H. H. W., "Gnetales," 290
 Peas, culinary, lxxviii
Pelexia maculata, xxxvi
Pentstemon antirrhinoides, A.M.,
 cxxxviii
centranthifolius, cxxxviii
comarrhenus, A.M., lviii
cordifolius, 54, 56, 62, cxxxviii
Eatonii, A.M., cxxxiii
procerus, A.M., lvi
utahensis, A.M., lvi
- Pernettya leucocarpa*, A.M., cxxxviii
Persea gratissima, seed germination,
 cxviii
Petalostemon purpureum, cxxxix
Phalaenopsis amabilis Elisabethae,
 A.M., lxi
 × 'Gilles Gratiot,' F.C.C., lxxv
Phaseolus Caracalla, A.M., cxli
Philadelphus Coulteri, 62
insignis, A.M., cxxxii
mexicanus, 62
Phlox eelworm, 88, 96, 97
 hot-water treatment, 98
Phoma lavandulae, 271
Photinia Davidsoniae, 60
serrulata, 60
Phygellus, 54
capensis, 58, 59, 62
coccineus, 59, 62
Pieris formosa, 62
Pilostegia viburnoides, 62, cxl
Pinguicula gypsicola, A.M., cxxxiv

- Pinus sylvestris* seedlings, cxix
Thunbergii cones, xxxvi
 "Plant Biology," by H. Godwin, reviewed, 296
Plantago cretica, cxvii
 lanceolata eelworm, 93
 variations, cxvii
 major eelworm, 93
 variations, cxvii
 maritima variations, cxvii
 "Plant-Life of the Balkan Peninsula," by W. B. Turrill, reviewed, 157
Plum 'Black Prince,' cxxiii
 'Victoria' seedlings, cxvii
Poa annua, cxix
 pratensis, cxix
 angustifolius, cxix
 subcoeruleus, cxix
Podocarpus Mannii, 269
 Poethig, K., and C. K. Schneider, "Hausgarten Technik," 160
 Pollination in orchards, cxvi, cxviii, cxix
Polyanthus 'Barrowby Gem,' A.M., lv
Polygonum Auberti, 55, 60, cxvii
 baldschuanicum, 55, 60
 Persicaria eelworm, 93
Potinara × 'Dorothy,' Dell Park var., F.C.C., clv
 × 'Rosita,' A.M., clix
 × 'Royal Purple' var. 'The Node,' A.M., clii
 "Practical Botany," by A. H. R. Buller, reviewed, 288
Pratia angulata, 112
Primula cachemiriana, 124
 denticulata, 123
 'Sir George Thursby,' A.M., liii
 Prince's Is., its flora, 266
Prostanthera lasianthos, 62
 "Proteases of Plants," by S. H. Vines, reviewed, 287
Prunus nana, A.M., lii
 triloba fl. pl., 59, 62
Pseudomonas juglandis, 249
Psoralea pinnata, 62
Pueraria, 55
Punica Granatum, 62
 fl. pl., 62
Pyracantha, 53
 angustifolia, 60, 62
 coccinea, 53, 56, 60
 Lalandei, 60
 crenulata, 55
 Gibbsii, 60
 Rogersiana, 60, 62
 yunnanensis, 60, 62
Pyrus 'Aldenharn Purple,' cxxxiv
 japonica, 56

Ramondia Nathaliae, A.M., liii
 Ramsay, L. W., "Landscaping the Home Grounds," 286
Ranunculus insignis, 104
 Lyallii, 104, 113
Ranula, 104
Raphiolepis japonica, 56

Raphithamnus cyanocarpus, 62
 "Recent Advances in Plant Physiology," by E. Barton-Wright, reviewed, 293
 Refrigeration, 64
 Rehmann, E., and E. A. Roberts, "American Plants for Gardens," 157
 Report of Council for 1928, viii
 1929, xcix
Rhabdotheramnus Solandri, 108
Rhipogonum scandens, 104
Rhodocistus Berthelotianus, 23
Rhododendron 'Delight,' A.M., xlvii
 Edgeworthii, 62
 euchaites, A.M., xlvii
 Forsterianum, 62
 'Fortune's Triumph,' A.M., liii
 fragrantissimum, 57, 62
 Keiskei, A.M., l
 'Lady Alice Fitzwilliam,' 57
 leucaspis, A.M., xliii
 Lindleyi, 57
 Maddenii, 57
 'Mrs. W. C. Slocock,' A.M., l
 'Muriel Messel,' A.M., liii
 semanteum, A.M., l
 Sesterianum, 62
 'Sir George Holford,' A.M., cli
 spinuliferum, 57, 62
 tephropeplum, A.M., l
 'Vanessa,' F.C.C., lvi
Rhubarb 'Hawke's Champagne,' A.M., xl
 'The Sutton,' A.M., xl
Ribes laurifolium, 58, 62
 speciosum, 54, 59, 62
 viburnifolium, 58, 62
 Rickett, H. W., see Robbins, W. J.
 Robbins, W. J., and H. W. Rickett, "Botany: a Text-Book," 289
 Roberts, E. A., see Rehmann, E.
Romulea Linaresii, xxxvi
Rosa anemonaeiflora, 60
 Banksiae, 60, 62
 bracteata, 60, 62
 chinensis viridiflora, cxvi
 cinnamomea, cxxxvi
 Ecae, 62
 × *glabra*, xxxvii
 haematodes, cxxxvi
 × *hibernica*, xxxvii
 laevigata, 60, 62
 Anemone, 60, 62
 moschata, 60
 Rose 'Autumn,' A.M., cxlv
 'Barbara Richards,' A.M., lii
 'Duchess of Athol,' A.M., lvii
 hybrids, xxxvii
 'President Hoover,' A.M., cxlv
 Roses, 53, 55, 62
 hybrid, xxxvii
 scented, lxxviii
Rubus australis, 55
 bambusarum, 62
 lineatus, 54, 62
 Ruwenzori Mts., flora, 267
 Ryle, R., etc., "How to Grow Roses," 289

- St. Thomas, its flora, 266
Salix alba × *vitellina*, xxxvii
 aurita × *cinerea*, xxxvii
 × *repens*, xxxvii
 hybrids, xxxvii
 phylicifolia, cxx
 × *repens*, cxx
 repens, xxxvi
Salvia patens 'Cambridge Blue,' A.M.,
 cxxxiv
 "Saturday in My Garden," by F. H.
 Farthing, reviewed, 287
Scabiosa Columbaria, heliotrope, cxvi
Schizandra chinensis, 60, 62
 grandiflora, 63
 rubrifolia, 63
 sphenanthera, 63
Schizanthus and eelworms, 93
Schizophragma hydrangeoides, 60,
 63
 Schneider, C. K., *see* Poethig, K.
 Scourge of Osiris, 19
Scyphanthus elegans, A.M., lvi
 Seabrook, W. P., "Modern Fruit
 Growing," 154
Sechium edule, xxxv
Senecio, 104
 laxifolius, 113
 Monroi, 112
 rotundifolius, 63
Sepultaria sepulta, xxxvi
 Seymour, A. B., "Host Index of Fungi
 of N. America," 156
Smilax aspera, 60
 china, 60
Solanum atropurpureum, cxvii
 crispum, 60, 63
 jasminoides, 60, 63
 laciniatum, cxvii
 sisymbriifolium, cxvii
 verbascifolium, cxvii
Solidago canadensis, eelworm, 93
Sollya Drummondii, 63
 heterophylla, 63
Sophora tetraptera, 56
 grandiflora, 60
 McNabiana, 63
 viciifolia, 63
Sophrolaeliocattleya × 'Gertrude
 Jekylls,' A.M., lxiii
 × 'Jean,' A.M., clvi
 × 'Tokio,' F.C.C., clxii
 × 'Yokohama,' F.C.C., lxiv
 Spain, its flora, cxix
 "Spanish Gardens," by C. M. Villiers-
 Stuart, reviewed, 154
Sparaxis bulbifera albiflora, cxx
Spathiphyllum sp., cxxxviii
 Spence, H., on walnuts, 244
Stapelia nobilis, A.M., lvi
Statice profusa superba, A.M., lii
 Stephenson, M., "Bacterial Metabol-
 ism," 297
 Sterility in *Cistus*, 7
 Stevens, G. A., *see* Ryle, R.
 Stocks for fruit trees, 169
Streptanthus cuprea, A.M., lviii
Streptocarpus "Improved Aldenham
 Strain," A.M., cxxxiv
- "Structure and Life of Forest Trees,"
 by M. Büsgen, reviewed, 290
 Stuart gardens in England, 212
Styrax, 54
 Wilsonii, 54, 59, 63
 Subterranean fungus, xxxvii
Syringa vulgaris 'Masséna,' A.G.M.,
 278
 'Souvenir de Ludwig
 Späth,' A.G.M., 279
- Tania, 269
Taraxacum officinale, eelworms, 93
Taxus baccata fr. *luteo*, A.M., cxliii
Tecoma grandiflora, 60
 sanguinea, 63
 Temple, A. A., "Flowers and Trees of
 Palestine," 288
Teucrium fruticans, 54, 59, 63
 "Textbook of Tropical Agriculture,"
 by Sir H. A. Nicholls, reviewed, 156
 Thiselton-Dyer, the late Sir W., xxxv
 Tincker, M. A. H., on ultra-violet ray
 glasses, 79
 Tipping, H. A., on Stuart gardens in
 England, 212
 Todd, Col. E. E., on the genus *Viola*,
 223
 Tomato 'Essex Wonder,' A.M., cxxi
 'Radio,' A.M., cxxi
Trachelospermum jasminoides, 63
 fol. var., 63
Trachycarpus Fortunei, 280
Tragopogon 'Hen and Chickens,' cxvi
 Transfusion of sap, xxxv
Tricuspidaria, 54
 lanceolata, 60, 63
Trifolium abnormalities, xxxv
 incarnatum, eelworm, 93
 pratense parviflorum, xxxv
 proliferum, xxxv
 repens parviflorum, xxxv
Tropaeolum azureum, A.M., lii
 speciosum, 63
 Truro deputation, xxx
 Tulip 'Clos de Vougeot,' A.M., lxx
 'Dorothy Ann,' A.M., lxx
 'Lady Ernie,' A.M., lxxi
 with aerial bulbs, cxvi
 Tulips, 71
 Turrill, W. B., "The Plant-Life of the
 Balkan Peninsula," 157
Tylenchus dipsaci, 88, 96
- Ulmus*, silver variegated, seedlings,
 cxvii
 Ultra-violet ray glasses, 79
Umbellularia californica, 60
- Vaccinium* × *intermedium*, 14
 Vegetable refrigeration, 69
Verbascum Brusa, cxxxi
Verbena corymbosa, A.M., cxxxii
Veronica Hulseana, 54, 63
 verna, xxxvi



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